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CHEMICAL CHARACTERIZATION OF WATER, SEDIMENT AND BIOTA FROM FIVE LABRADOR-QUEBEC TRANSBOUNDARY BASINS

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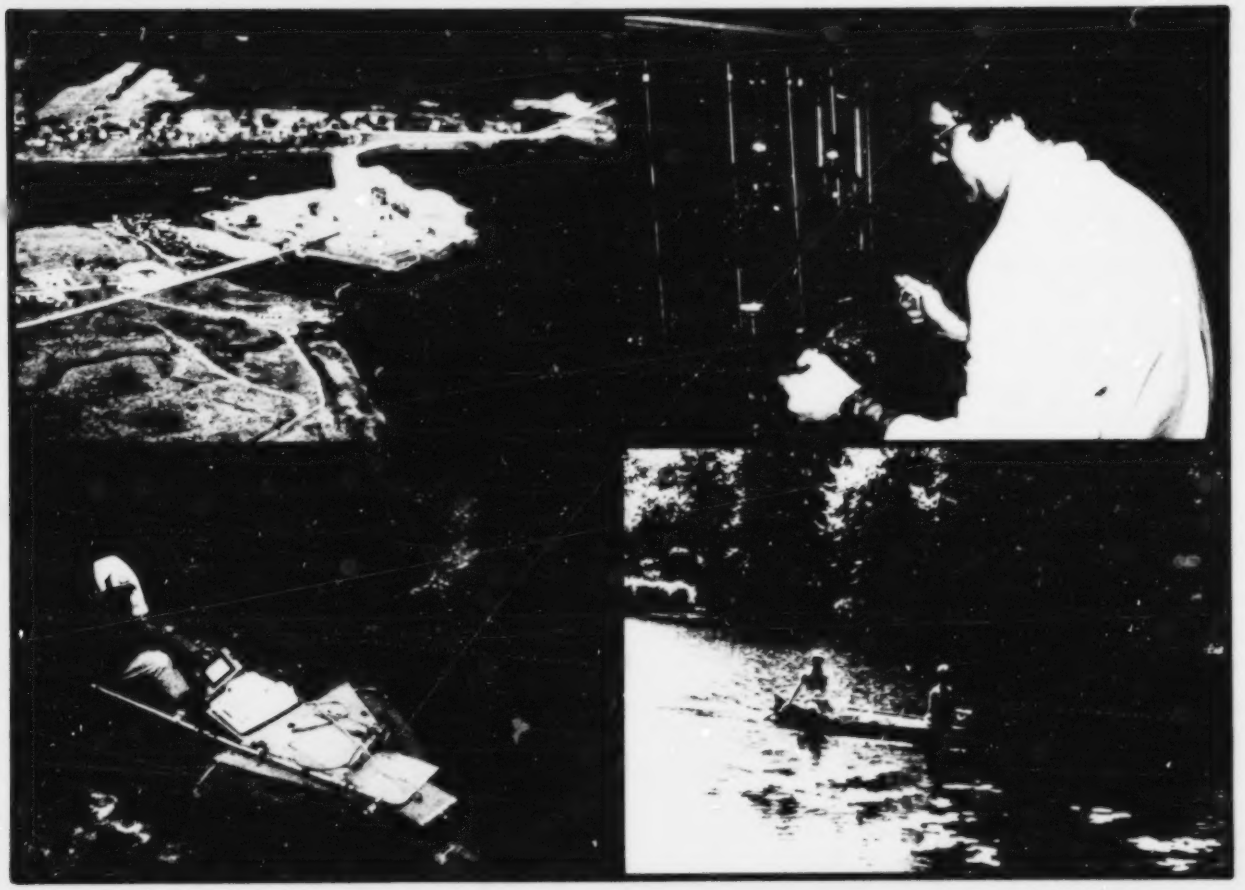

Canada

INLAND WATERS DIRECTORATE
ATLANTIC REGION
WATER QUALITY BRANCH
MONCTON, NEW BRUNSWICK

Chemical Characterization of Water, Sediment and Biota

From

Five Labrador-Quebec Transboundary Basins

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A copy will be made available in French upon request

TABLE OF CONTENTS

	PAGE
Acknowledgements	ii
Foreword	iii
Avant-Propos	v
Introduction	1
Methods	4
Results	8
Water - Major Ions and Trace Metals	8
- Chlorinated Hydrocarbon Pesticide and PCB Residues	11
Bottom Sediments - Chlorinated Hydrocarbon Pesticide and PCB Residues	12
- Metals	13
Fish Tissue - Metals	24
- Chlorinated Hydrocarbon Pesticide and PCB Residues	40
Summary	48
References	51
Figures	96
Tables	57

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FOREWORD

The border between Labrador and Quebec follows the 52° latitude line from near L'Anse-Au-Clair on the Strait of Belle Isle to approximately 65°50' longitude, from where it follows the Romaine River to its source and then the height of land up to the Ungava Peninsula. The lakes and rivers which straddle the southern border are all located in isolated areas with no easy access. Hence, they have not been developed to date, although the potential does exist for hydro-electric dam construction and the exploitation of forest resources in some of the transboundary basins. If development of either type were to occur, water quality in these transboundary basins could be adversely affected.

Due to their inaccessibility and lack of human activity, the basins in this area have not been well surveyed in terms of water, sediment and biota quality. As part of its mandate to monitor quality of interprovincial waters for baseline evaluation, the Water Quality Branch, Inland Waters Directorate of Environment Canada (Atlantic Region) initiated a comprehensive survey of the major transboundary watersheds of Labrador and Quebec. Beginning in 1980, each of the five major transboundary basins was visited and samples of water, bottom sediments and fish tissue were collected and returned to the Moncton laboratory for chemical analysis. The transboundary basins surveyed and the dates of each survey were as follows:

Little Mecatina (Lac Donquan) and Joir Rivers - Sept. 1980

Natashquan River (Lac Fonteneau) - Sept. 1981

Romaine River (Lac Brule) - Sept. 1982

St. Augustin River (Unnamed Lake) - Sept. 1983

St. Paul River (Unnamed Lake) - Sept. 1984

Two previous reports - Water Quality of the Labrador-Quebec Watersheds - Little Mecatina and Natashquan Rivers (IWD-AR-WQB-83-51) and Water Quality of the Labrador-Quebec Watersheds - Romaine and St. Augustin Rivers (IWD-AR-WQB-) discuss the results obtained during the surveys of the first four major transboundary basins.

This report consolidates the results obtained during surveys of all five major transboundary basins listed above, and compares the water quality characteristics of the five different drainage basins.

AVANT-PROPOS

La frontiere separant le Labrador et le Quebec suit le 52^{ieme} degre de latitude a partir des alentours de l'Anse-Au-Clair situe en bordure du detroit de Belle Isle, jusqu'a environ 65^{o} 51' de longitude. A cet endroit, elle longe la riviere Romaine jusqu'a sa source et, par la suite, elle suit les hautes terres qui menent a la Peninsule d'Ungava. Les lacs et les rivieres qui chevauchent la frontiere sud sont tous situes dans une region isolee d'acces difficile. En consequence, ils n'ont pas ete developpes jusqu'a ce jour, bien qu'un potentiel de developpement hydro-electrique et d'exploitation forestiere existe. Si l'un de ces types de developpement devait se produire, la qualite de l'eau de ces bassins pourrait etre affectee defavorablement.

Vu leur inaccessibilite et l'absence d'activite humaine, les ressources aquatiques de cette region n'ont pas ete controlees en terme de qualite des eaux, des sediments et du biota. La Direction de la qualite des eaux de la Direction generale des eaux interieures d'Environnement Canada (region de l'Atlantique) a initie un important releve de base de la qualite des eaux des principaux bassins hydrographiques transfrontaliers du Labrador et du Quebec. Commence en 1980, chacun des cinq principaux bassins transfrontaliers furent visites et des echantillons d'eau, de sediments de fond et de tissus de poisson furent recueillis puis envoyes au laboratoire de Moncton pour y subir des analyses chimiques. La liste des bassins transfrontaliers visites ainsi que

les dates de chacun des releves figurent comme suit:

- Rivieres Petite Mecatina (lac Donquan) et Joirs - sept. 1980
- Riviere Natashquan (lac Fonteneau) - sept. 1981
- Riviere Romaine (lac Brule) - sept. 1982
- Riviere St.-Augustin (lac sans nom) - sept. 1983
- Riviere St.-Paul (lac sans nom) - sept. 1984

Deux precedents rapports intitules "Water Quality of the Labrador-Quebec Watersheds - Little Mecatina and Natashquan Rivers" (IWD-AR-WQB-83-51) et "Water Quality of the Labrador-Quebec Watersheds - Romaine and St. Augustin Rivers" (IWD-AR-WQB-) discutent des resultats obtenus durant les releves effectues dans les quatre premiers bassins transfrontaliers nommes plus haut.

Le present rapport consolide les resultats obtenus durant les releves de ces cinq bassins et compare les caracteristiques de qualite des eaux de ces derniers.

INTRODUCTION

Historically the western boundary between Labrador and Quebec was arbitrarily defined to be the Romaine River to its source and then the height of land up to the Ungava Peninsula, and thus all of the interprovincial rivers, with the exception of the Romaine, originate in that part of Labrador south of the Churchill River Basin and flow in a general southward direction into the Gulf of St. Lawrence. The Romaine River originates in the Lac Long area of Quebec. Beginning with the Romaine in the west, the Natashquan, Little Mecatina-Joir, St. Augustin and St. Paul basins lie adjacent to each other and extend over the 480 km long southern boundary formed by the 52° latitude line between Labrador and Quebec. Fig. 1 provides a general indication of the location of the five major transboundary basins.

All of the basins contain numerous lakes, either headwater lakes or river expansions which behave as lakes during periods of low river discharge. Lake environments tend to be areas of accumulation, and generally yield a more complete water quality record, especially when the data gathering effort is restricted to a short term survey. In view of this and the fact that these portions of the river basins are most likely to be affected by any development in the future, the work in each of the basins was concentrated on a lake.

In the Romaine basin Lac Brule, a river expansion lake, the

eastern shoreline of which forms part of the western boundary between Labrador and Quebec, was surveyed in 1982. In the Natashquan basin, Lac Fonteneau, a large headwater lake which straddles the Labrador-Quebec border and drains into the East Natashquan River was surveyed in 1981. In the Little Mecatina River Basin, Lac Donquan, a river expansion lake which straddles the Labrador-Quebec border was surveyed in 1980. In the St. Augustin basin, a small unnamed headwater lake (herein called St. Augustin Lake) lying approx. 65 km north of the Labrador-Quebec boundary and draining into the St. Augustin River was surveyed in 1983. In the St. Paul basin, a small unnamed headwater lake (herein called St. Paul Lake) lying approx. 45 km north of the Labrador-Quebec border was surveyed in 1984.

Fig. 2 indicates the general locations of the five lakes surveyed. Tables 1 to 5 and Figs. 3 to 7 indicate the locations of water and bottom sediment sampling stations in each of the lakes. Table 6 lists some of the physical characteristics of the five lakes.

For a description of the topography, vegetation and geology of the areas surrounding Lacs Donquan and Fonteneau, see Lockerbie and Clair (1983). For the same information concerning the areas surrounding Lac Brule and St. Augustin Lake, see Lockerbie (1985).

The St. Paul River originates in a number of small lakes and ponds draining extensive areas of string bog on the southern slopes

of the Eagle River plateau in southeastern Labrador, and discharges into the Gulf of St. Lawrence at Riviere-St.-Paul on the Quebec northshore. At the Labrador-Quebec boundary the St. Paul River drains an area of 4812 km^2 or 70% of the total drainage area of 6874 km^2.

All five transboundary basins lie within the metamorphic Granville structural province of the Canadian Shield. The two previous reports discuss the surficial and bedrock geology of the areas underlying Lac Brule, Lac Fonteneau, Lac Donquan and St. Augustin Lake. The bedrock underlying most of the St. Paul river basin consists mainly of granite and allied plutonic rocks and syenite and alkalic rocks belonging to the Neohelikian age. Minor alluvial and fluvioglacial deposits are found in the basin. A fair number of eskers and extensive areas of string bogs lie in the St. Paul River headwaters. The topography in this area of Labrador is rolling with many knolls characterized by thin soils. Forest cover is predominently Black Spruce (Picea mariana) on the lower slopes and valley floors, while some Larch (Larix laricina)) grow on marginal wet sites and White Spruce (Picea glauca) and Balsam Fir (Abies balsamea) are confined to well drained alluvium. Areas of recent burns are often covered with blueberry shrubs, lichen and White Birch (Betula papyrifera). Roughly 25% of the St. Paul Lake drainage area is comprised of string bogs.

METHODS

In general, the approach used in conducting water quality studies of all five transboundary basins was similar. It consisted of a week-long sampling survey of each of the basins during which all field sampling equipment, including an inflatable boat and outboard motor were flown to a lake amenable to landing a float-equipped aircraft. Here a field camp was established and samples of water, bottom sediments and fish tissue were collected. All of the field work was performed during the early part of September, when homothermal conditions exist in most Labrador lakes and when air temperatures are cool enough to suppress the indomitable black-fly population which makes summer field work in Labrador very uncomfortable.

Generally, four water and bottom sediment sampling stations were established in each of the lakes - two near the deepest part of the lakes, based upon a very limited bathymetric survey, and one each near the major inlet and outlet.

Sampling of water and bottom sediment was performed using standard field methods from Anonymous (1983). Bottom sediment samples were taken in triplicate (three separate grabs) using either a solid brass standard Wildco-Ekman Dredge (152 mm x 152 mm x 152 mm) (used for Lac Donquan and Lac Fonteneau) or an all steel Ponar Grab Dredge - Petite Version (152 mm x 152 mm) (used in Lac Brule, St. Augustin Lake and St. Paul Lake). Water samples were

generally analyzed within 3 weeks after returning to the Moncton Laboratory from the field survey, d bottom sediment and fish tissue analysis was completed within 6 months after sampling. All chemical parameters for water, sediment and fish were analyzed using methods described in Anonymous (1985).

Fish specimens were obtained with a 92 m long gill net with 46 m of 7.6 cm mesh and 46 m of 9.0 cm mesh set at a location in each lake chosen on the basis of lake morphometry.

Immediately upon capture the fork and total length of fish were measured to the nearest 10 mm and fish were weighed to the neareast 0.01 kg. Sex determination of the fish was made in the field immediately after capture, and samples of gonad, liver and muscle tissue were removed using precautions to prevent sample contamination.

Fish and bottom sediment samples were wrapped in aluminum foil for trace organic analyses or Whirl-Pak plastic bags for metal analyses and kept cool (in picnic coolers in the case of Lac Donquan, Lac Fonteneau and Lac Brule - in battery operated Koolatrons in the case of St. Augustin lake and St. Paul Lake), until they were frozen after returning to Goose Bay. Lipid content determinations of fish tissue samples from St. Augustin and St. Paul Lakes were made by extracting 10 gms of sample with 2 x 100 mL portions of acetonitrile using a Polytron homogenizer. The extract was then filtered through filter paper into a tared round-bottomed

flask, the solvent was removed under reduced pressure, and the weight of the residue was determined as lipid.

Non-residual metal determinations in bottom sediments were made by a method which quantifies the fraction of the metal that is not part of the silicate matrix of the rock from which the sediment is derived. This includes metal adsorbed on sediment particles, complexed by and adsorbed on organic matter, and in the form of insoluble salts. To normalize the particle size distribution in the sediment, and consequently the metal content, the minus 80-mesh (<177 um) portion of the sediment was analyzed. Total metal determinations (made in the case of Cu, Pb, Zn and Cd in the bottom sediments from St. Augustin Lake) were made by a method designed to provide complete destruction of the silicate matrix in order to release all forms of metal. These include metal in the rock matrix, metal adsorbed on the sediment particles and metal in the form of insoluble salts and organic complexes. Decomposition of the sample was carried out in a sealed Teflon bomb, using high temperatures, which allowed volatilization losses to be kept to a minimum.

Mercury concentrations in bottom sediments (measured in bottom sediments from all five lakes) were measured by an analytical method which involves the extraction of the inorganic forms of mercury and the oxidation of organo-mercurials with sulphuric acid, nitric acid, hydrochloric acid, potassium persulfate and potassium permanganate. This method has been proven reliable in ensuring

total recovery of mercury from sediments of very high organic content.

Values of chlorinated hydrocarbon pesticide and PCB residues reported as "trace" in Table 12 result from chromatogram peak heights which were below the detection limit of the analytical method but which were felt by the analyst to be positive indication of the presence of a compound. For purposes of data analysis and graphing in this report, values reported as 'trace" were recorded as the absolute value of the detection limit of the analytical method employed, and values reported as "less than detection limit" were recorded as the absolute value of the detection limit - 1% (detection limit) reported to five significant digits.

For statistical purposes, the median was used as a parameter of central tendency in most cases throughout the report, because of its robustness when dealing with small sample sizes.

RESULTS

Water - Major Ion and Trace Metal Chemistry

The results of major ion and trace metal analyses of the water samples from the five lakes are shown in Table 7. Tables 8 and 9 indicate the major ionic components of the water (expressed in equivalent concentration units) and several calculated parameters respectively for water samples collected from all five lakes.

Typical of most lakes in Southern Labrador, they have very dilute waters (specific conductance ranging from 8.3 to 13.8 uS/cm); sum of constituents from 4.09 to 11.36 mg/L), color ranging from low (15 units in St. Augustin Lake to fairly high (70 units) in St. Paul lake) and pH values in the 5.8 to 6.7 range. Total alkalinity varied from 1.2 mg/L as $CaCO_3$ (in St. Paul Lake) to 3.8 mg/L as $CaCO_3$ in Lac Donquan. Turbidity levels in the four lakes where it was measured (all except St. Paul Lake) were low ranging from 0.3 to 0.7 J.T.U., and dissolved organic carbon was low in the three lakes where it was measured (Lac Brule, St. Augustin and St. Paul Lakes) ranging from 3.6 to 5.8 mg/L.

Fig. 7 to 12 depict the mean levels of water color, extractable iron, pH, total alkalinity, sum of constituents and drainage area of each lake sampled, respectively.

Although the water of all five lakes is very dilute, there

were differences in the major ion chemistry of the lake waters (Fig. 13). Generally, the trend was that the larger the drainage area of the lake, the greater the sum of constituents in the lake waters. In Lac Donquan, Lac Brule and St. Augustin Lake the predominant cation was calcium and the order of concentration of the predominant cations was Ca>Mg>Na>K. The predominent anion was HCO_3 and the anionic order of dominance was $HCO_3>SO_4>Cl$.

However, in Lac Fonteneau, although calcium was still the predominant cation, the sodium cation was the more dominant of the other three cations, with the order of dominance being Ca>Na>Mg>K; the predominant anion in this case was SO_4 with the anionic order of dominance being $SO_4>HCO_3>Cl$.

In St. Paul Lake water the preponderant cation was still calcium, but the magnesium cation was the more preponderant of the other three cations, the order of dominance being Ca>Mg>Na>K; the preponderant anion was again SO_4 with the anionic order of dominance being $SO_4>HCO_3>Cl$.

In terms of major ion chemistry, the five lakes in the Labrador-Quebec transboundary basins appear to be typical of surface waters in Labrador. In a more extensive survey of the water chemistry of lakes and streams in Labrador in 1979-1981, Clair et al. (1982) found that pH was in the range 5.5 to 6.5 in 87% of 164 stations sampled, total alkalinities were in the range 0 to 4.0 mg/L as $CaCO_3$ in 78% of 162 stations sampled, specific

conductances were in the range 2 to 15 uS/cm in 87% of 162 stations sampled, turbidities were in the range 0.2 to 0.8 J.T.U. in 90% of 93 locations sampled, and water colour was in the range of 10 to 70 units in 55% of 164 stations sampled.

Among the metallic ions analyzed only iron was found in significant concentrations, with the lowest levels (0.15 mg/L) found in St. Augustin Lake and the highest (1.10 mg/L) in St. Paul Lake. There is good correlation between apparent colour and extractable iron concentrations (r^2 = 0.95) in the five lakes surveyed (Fig. 14). Although dissolved organic carbon was analyzed only in lake waters from Lac Brule, St. Augustin Lake and St. Paul Lake, and humic acids only in the case of Lac Donquan and St. Paul Lake, both of these parameters were found to correlate with apparent color of the lake waters. Figs. 14A and 14B depict the relationships, and indicate that much of the difference in color among the five lake waters can probably be attributed to differences in the amount of dissolved humic substances. The ability of humic acids to form chelates with iron, particularly in the ferric state (Fe^{+++}), probably accounts for the good correlation between water colour and extractable iron concentrations found in the lake water.

Copper (extractable) and zinc (extractable) were found at low levels in St. Paul lake waters - copper at the 0.004 mg/L level and zinc at the 0.03 mg/L level. Extractable aluminum ranged from 0.06 mg/L in Lac Brule to 0.1 mg/L in St. Paul Lake. Mercury was below

the detection limit (0.020 ug/L) of the analytical method in all of the lake waters.

Water - Chlorinated Hydrocarbon Pesticide & PCB Residues

Water samples from each lake (sometimes in duplicate) were also analyzed for chlorinated hydrocarbon pesticide and PCB residues. Tables 10 and 10A lists the parameters analyzed, the corresponding NAQUADAT code for the analytical method used and the detection limit of the method employed.

Table 11 lists the results obtained from these analyses for all five lakes. The only detectable concentrations of these parameters measured were alpha-BHC (0.015 - 0.028 ug/l) and gamma-BHC (0.001 - 0.002 ug/l) in Lac Brule, alpha-BHC (0.002 - 0.008 ug/l) in St. Augustin Lake and alpha-BHC (0.008 - 0.009 ug/l) in St. Paul Lake.

Both of these compounds are known to be ubiquitous in the Atlantic Region with their suspected source being long-range transport via the atmosphere. Alpha-BHC is not an active ingredient in any pesticide product, but it is a low level impurity in Lindane (less than 1%), and a significant impurity in BHC (60-70%) which was viewed at one time by entomologists to be a more effective pesticide than Lindane. However, BHC (mixed isomers) was last registered for use in Canada in 1972, yet alpha-BHC is observed on a wide geographic scale and in quantities greater than

would be expected on the basis of past use and impurity levels in present Lindane products (Gummer 1979). It has also been found in the surface waters of the Manitoba Canadian Shield district at concentrations ranging from 0.003 ug/L to 0.006 ug/L (Gummer, 1979), where neither Lindane nor alpha-BHC have been used. These compounds were also found in rainwater sampled in Kejimkujik National Park in southwestern Nova Scotia and near Ellerslie, Prince Edward Island in 1982, with mean annual concentrations of 0.025 ug/L alpha-BHC, 0.0033 ug/L gamma-BHC, 0.025 ug/L alpha-BHC and 0.0045 ug/L gamma-BHC respectively in samples collected on a monthly composite basis (Brun, 1982). The higher volatility and lower solubility of gamma-BHC may account for the lower levels and fewer detections of this compound than for alpha-BHC.

No apparent reason can be given for the difference in concentrations of these two compounds between the five lakes surveyed, except to say that the highest concentrations were found in Lac Brule, which also has the largest surface area and the highest elevation of all the lakes sampled.

Bottom Sediments - Chlorinated Hydrocarbon Pesticide & PCB Residues

Triplicate samples of bottom sediment (three separate grabs at each station) were collected in each lake and were also analyzed for chlorinated hydrocarbon pesticide and PCB residues. Tables 10 and 10A list the PCB and pesticide residue parameters analyzed, the corresponding NAQUADAT codes for the analytical method used and the

detection limit for the method employed. Table 12 lists the concentrations of chlorinated hydrocarbon pesticide and PCB residues found in bottom sediment samples taken from all five lakes.

The only positive values found were traces of p,p'-DDE in bottom sediments from the sampling stations in Lac Fonteneau and from one station in Lac Brule and in St. Paul Lake. Bottom sediments sampled from Lac Fonteneau were also found to contain from trace to 0.015 mg/kg quantities of total PCB. One possible reason why PCB's were detected only in the bottom sediments of Lac Fonteneau is that this lake has a much larger relative drainage area than the other four lakes, hence probably a much lower flushing rate allowing greater accumulation of any deposited and suspended contaminants.

Bottom Sediments - Metals

Triplicate samples of bottom sediments (three separate grabs at each station) were also collected in each lake and were analyzed for a range of metal parameters. Table 13 lists the metal parameters analyzed, the NAQUADAT code referring to the analytical method used, and the detection limit of the method. Table 14 includes the raw data for metals analyzed in the bottom sediment from all five lakes.

There was some inconsistency in the determination of metals in

bottom sediments from the five lakes due to the unavailability of analytical methods in the laboratory at the time the samples were submitted. Hence, samples from Lac Donquan were not analyzed for lead, and the non-residual form of cadmium (NAQUADAT Code 48054L) was measured in bottom sediments from this lake. The non-residual form of copper (NAQUADAT Code 29054L) was measured in bottom sediments from Lac Donquan, Lac Fonteneau, Lac Brule and St. Paul Lake, but in 1983 the total form of copper (NAQUADAT Code 29051L) was measured in bottom sediments from St. Augustin Lake. The non-residual form of lead (NAQUADAT Code 82054L) was measured in bottom sediments from Lac Fonteneau, Lac Brule and St. Paul Lake, but in 1983 the total form of lead (NAQUADAT Code 82050L) was measured in bottom sediments samples from St. Augustin Lake. The non-residual form of zinc (NAQUADAT Code 30054L) was measured in bottom sediments sampled from Lac Donquan, Lac Fonteneau, Lac Brule and St. Paul Lake. But in 1983, the total form of zinc (NAQUADAT Code 30051L) was measured in bottom sediments sampled from St. Augustin Lake. Neither form of cadmium was measured in bottom sediment samples from Lac Fonteneau, Lac Brule or St. Paul Lake, but the non-residual form of this metal was measured in samples from Lac Donquan in 1980 and the total form in samples from St. Augustin Lake in 1983 (NAQUADAT Code 48050L). No Aluminum determinations were made in 1983. Total mercury determinations were made on bottom sediment samples from all five lakes.

Total organic carbon determinations (NAQUADAT Code 06076L) were made only on bottom sediment samples collected in 1984 from

St. Paul Lake.

Figs. 15 to 20 show the comparative range and median (of 12 samples) levels of mercury, copper, aluminum, cadmium, lead and zinc in bottom sediments of each of the lakes sampled. In four of the lakes sampled, median levels of total mercury in bottom sediments are similar (approx. 0.060 mg/kg), but the mercury content of bottom sediment from St. Augustin Lake is much higher (0.180 mg/kg).

Mercury can enter the aquatic environment from several sources, including both wet and dry atmospheric deposition and soil and bedrock weathering. Because of the remoteness of these northern lakes from any source of industrial pollution, however, it is likely that the most significant source of input of mercury is from the weathering process on bedrock and soils in the drainage basin.

In a compilation of data on mercury levels in unpolluted recent lake sediments Jonasson and Boyle (1972) found that the natural mercury content of recent lake sediments in Canada ranged from 0.010 to 0.700 mg/kg with a mean level of 0.073 mg/kg. This mean level compares very well with the median (of 12 samples) level measured in four of the five lakes surveyed. The median levels of mercury in the bottom sediments of Lac Donquan, Lac Fonteneau, Lac Brule, and St. Paul Lake were respectively 0.050 mg/kg, 0.062 mg/kg, 0.040 mg/kg and 0.065 mg/kg. However, the median (of 12

samples) level of mercury in the bottom sediments of St. Augustin Lake was found to be much higher (0.180 mg/kg).

An arbitrary criteria level of 0.1 mg/kg has been selected by the Environmental Protection Service as being the upper limit of the mercury content of sediments in the Atlantic Region in the absence of known mercury sources. Sediments whose mercury level exceed 0.1 mg/kg may be considered to be enriched with mercury; however, a caution is issued about inferring that levels beyond 0.1 mg/kg are indicative of pollution because it is recognized that the source of enrichment may be natural, and this would appear to be the case in St. Augustin Lake.

It is known that the levels of mercury in sediments is highly variable, with the lowest values found in the sand fraction and the highest mercury content occurring in sediments rich in organic matter. A number of investigators have observed a good positive correlation between mercury content and organic matter in aquatic sediments (Reeder et al. 1979; Wilson and Travers, 1976). Although no particle size analysis or organic content determinations were made on the sediments collected from St. Augustin Lake, it is hypothesized that this accounts for the high levels of mercury measured in the bottom sediments of this lake.

In 1984 bottom sediments from St. Paul Lake (lying in a river basin adjacent to St. Augustin Lake and in a similar geological environment) were analyzed for both mercury and total organic

carbon. Although the median level of mercury in the bottom sediments of St. Paul Lake (0.065 mg/kg) was not nearly as high as those from St. Augustin Lake, mercury levels were found to cover quite a wide range (<0.020 to 0.130 mg/kg). Similarly, total organic carbon content of the bottom sediments was found to range from 2.2% to 29.8%. There was a fairly strong relationship between mercury level and total organic carbon content (r^2 = 0.84) in the samples of bottom sediment from St. Paul Lake (Fig. 21).

St. Augustin Lake is a true headwater lake with no well defined inflow and a very poorly defined outflow, and visual observation of the bottom sediment sampled from St. Augustin Lake indicated a high proportion of oxidized organic material - more so than that from St. Paul Lake, and this may explain the high mercury concentrations in the bottom sediments of St. Augustin Lake.

The other metal in bottom sediment which exhibited considerable differences between the five lakes was zinc. Median levels ranged from 12.0 mg/kg and 20 mg/kg in Lacs Donquan and Brule respectively to 39.0 mg/kg in St. Paul Lake, 46.0 mg/kg in Lac Fonteneau and 51.5 mg/kg (Total Zn) in St. Augustin Lake.

Since samples were analyzed for either one form or the other of zinc (non-residual or total) it is difficult to compare the levels of zinc in the bottom sediments of all five lakes, but it would be expected that total zinc would be somewhat higher than non-residual zinc, and the high level (median of 51.5 mg/kg) of

zinc (total) measured in the bottom sediments of St. Augustin Lake may be a reflection of the different method used to analyze these samples. The median value of 51.5 mg/kg total zinc found in the bottom sediments of St. Augustin Lake compares very well with the median value of 54 mg/kg total zinc found in the bottom sediments of 597 lakes and ponds in Southern Labrador sampled by the Geological Survey of Canada in 1977. This median value of 54 mg/kg total zinc is for lakes and ponds on the same 1:250,000 scale NTS mapsheet as St. Augustin Lake and for only those lakes and ponds where the underlying rock structure is the same as that underlying St. Augustin Lake.

A number of investigators have shown a strong negative correlation between zinc concentrations in bottom sediments and the percentage of sand in the sample (Taylor and Demayo, 1980). It has been demonstrated that, when sediments contain low amounts of organic materials (up to 12% loss on Ignition) these materials limit the concentration of zinc in the sediments. Above 50% Loss on Ignition, the amount of zinc in the system controls its concentration in the sediments. Here again it is hypothesized that the predominance of sand and gravel in the bottom sediments of Lac Donquan and Lac Brule (both river expansion lakes) compared to the relatively high proportion of organic matter in the lake bottom sediments of Lac Fonteneau, St. Augustin Lake and St. Paul Lake (all headwater lakes) explain the differences in zinc concentrations in the bottom sediments of the five lakes. In St. Paul Lake, where non-residual zinc in bottom sediment samples was

found to range from 13.0 mg/kg to 40.0 mg/kg, there was found to be a relationship between non-residual zinc concentrations and % organic carbon in the samples (r^2 = 0.72) (Fig. 22). Although not as well defined as the relationship between mercury and total organic carbon, it does indicate that the higher concentrations of non-residual zinc are associated with sediments having total organic carbon content greater than 12.0%.

The only other metal which was analyzed in bottom sediment samples from all five lakes was copper. The non-residual form of copper was measured in bottom sediment samples from Lac Donquan, Lac Fonteneau, Lac Brule and St. Paul Lake, and the total concentration of copper in bottom sediment samples from St. Augustin Lake was measured. Again, because either one form or the other of the metal was determined, it is difficult to compare the levels in the bottom sediments of all five lakes, but, as with zinc, it would be expected that the total form of the metal would be higher in concentration than the non-residual form, and the fact that the highest level (median of 12 samples = 9.35 mg/kg) was found in the bottom sediment from St. Augustin Lake may reflect the analytical method used. However, there was not a great deal of variation in the levels of copper measured in the bottom sediments of all five lakes. Median values (of 12 samples from each lake) ranged from 4.5 mg/kg and 5.5 mg/kg in St. Paul Lake and Lac Donquan respectively to 6.15 and 6.7 mg/kg in Lac Fonteneau and Lac Brule respectively for non-residual copper, and the median level of total copper in St. Augustin Lake bottom sediments was 9.35. This

latter value compares with a total copper median concentration of 10.0 mg/kg found in the Geological Survey of Canada lake water and sediment survey mentioned above for 597 lakes and ponds in Southern Labrador (G.S.C. 1977). In St. Paul Lake, where non-residual copper concentrations in bottom sediments were found to range from 2.0 mg/kg to 5.0 mg/kg, it was also found that there was a relationship between non-residual copper concentrations and % total organic carbon in the bottom sediments (r^2 = 0.71). Fig. 23 shows the relationship, and as was the case for zinc, it appears that the higher levels of non-residual copper are associated with bottom sediments which have % total organic carbon > 12.0.

The non-residual form of lead was measured in the bottom sediments from Lac Fonteneau, Lac Brule and St. Paul Lake, and median concentrations (12 samples from each lake) were found to range from 5.15 mg/kg in Lac Brule to 11.0 mg/kg in Lac Fonteneau and 11.5 mg/kg in St. Paul Lake. However, in this case, the median value for total lead measured in the bottom sediments of St. Augustin Lake (3.5 mg/kg) is lower than the median value of non-residual lead measured in the bottom sediments of the other three lakes.

In St. Paul Lake where non-residual lead concentrations were found to range from 4.0 mg/kg to 15.0 mg/kg, a fairly strong relationship was found to exist (r^2 = 0.80) between concentrations of non-residual lead and % total organic carbon of the bottom sediment. Fig. 24 shows this relationship, and indicates that

values of non-residual lead greater than 6 mg/kg are associated with % organic carbon greater than 12. The median value of 3.5 mg/kg total lead found in the bottom sediments from St. Augustin lake is 3.5 times higher than the median concentration of total lead found in the Geological Survey of Canada lake water and sediment survey (GSC 1977). Although no definite reason exists to suspect sample contamination in the case of this parameter, the variation among triplicate grabs for this parameter was much greater than that for any of the other metals analyzed in bottom sediments.

Non-residual aluminum was measured in bottom sediments from four of the five lakes. It ranged from a median (of 12 samples in each lake) level of 2165mg/kg in Lac Donquan to 4560mg/kg, 5000mg/kg and 7100mg/kg in Lac Brule, St. Paul Lake and Lac Fonteneau respectively. In St. Paul Lake where non-residual aluminum in bottom sediments ranged from 1400mg/kg to 6000mg/kg, it was found that here again there was a relationship between levels of non-residual aluminum and % total organic carbon of the samples ($r^2 = 0.63$). Although not as well defined as the relationships for the other metals and % T.O.C., it does seem to indicate that the higher levels of non-residual aluminum are associated with % T.O.C. greater than 12% in bottom sediments (Fig. 25).

Cadmium was measured in the bottom sediments from two of the lakes - the non-residual form in the bottom sediment from Lac Donquan, where all samples were found to contain less that the

detection limit of the analytical method employed (0.10mg/kg) and the total form in samples from St. Augustin Lake where the median level (of 12 samples) was 0.27 mg/kg. In this lake, total cadmium was found to range from 0.20mg/kg to 0.54 mg/kg, which is within the range of 0.1-1.0mg/kg total cadmium content typical of intermediate rocks (granodiorite, syenite, diorite) which underlay St. Augustin Lake (National Research Council, 1979).

Unlike mercury, the other metals in bottom sediments discussed above do not have significant implications for bio-accumulation in these lakes, and their levels in lake bottom sediments can be seen as typical of pristine Canadian Shield lake sediments. However, the wide range of naturally occurring mercury concentrations in the bottom sediments of these five lakes serve to point out the ubiquitous nature of this element in Labrador, and may have important implications for future development involving large scale disturbance of the land surface or the inundation of large areas by water.

Fish

Tables 15 to 19 show the species and meristic characteristics of the fish captured from each of the five lakes surveyed. Only northern pike and some white suckers captured in St. Augustin Lake in 1983 were aged. Because of sample size requirements (approx. 10 gms), only one type of analysis was carried out on liver and gonadal tissue from each fish; i.e. samples from each fish were

analyzed only for trace metals or for chlorinated hydrocarbon pesticide and PCB residues. In general, the type of analysis carried out on any particular fish was chosen at random, with an effort to have about 1/2 the total number of fish captured in one lake analyzed for trace metals and the other 1/2 analyzed for chlorinated hydrocarbon pesticide and PCB residues.

More fish were caught in some lakes than in others, and the species captured differed to some extent from lake to lake. Because of this, and because of the smaller number of fish of some species captured in some of the lakes, it is difficult to make comparisons of the levels of metals or of chlorinated hydrocarbon pesticide and PCB residues in fish tissue of one species from lake to lake.

The only species of fish which was captured in all five lakes was northern pike (Esox lucius) and the number captured ranged from a high of 19 in Lac Fonteneau to only 1 in St. Paul Lake. Some of the species were only captured in one of the lakes; eg: muskie (Esox masquinongy) in Lac Fonteneau, ouananiche (Salmo ouananiche) in Lac Brule and longnose suckers (Catostomus castostomus) in St. Paul Lake.

The species of fish captured from all five lakes cover a broad spectrum of trophic levels ranging from suckers which are entirely bottom feeders living off the benthic community to northern pike, which are omnivorous and lake trout which are both predaceous and

the longest lived of all the species caught (Lockerbie, 1986).

Metals in Fish

Table 20 lists the metal parameters for which fish tissue samples from all five lakes were analyzed, the corresponding NAQUADAT Codes and the detection limits of the analytical methods employed. Table 21 lists the concentrations of the metals found in the different tissue types of the various species of fish captured from all five lakes.

Here again, there was some inconsistency in the determination of metals in fish tissue samples from the five lakes. Thus, fish tissue samples from fish captured in Lac Donquan in 1980 were not analyzed for lead, nickel or chromium, while those from fish captured in Lac Fonteneau in 1981 were analyzed for lead but not for nickel or chromium. Tissue samples from fish captured in St. Augustin Lake in 1983 were analyzed for chromium but not for nickel, and those from fish captured in St. Paul Lake in 1984 were analyzed for nickel but not for chromium.

Figs. 26 to 33 show the median, range and number of samples analyzed for Hg, Cd, Cu, Pb, Zn, Al, Ni, and Cr in the different types of tissue sampled from the various species of fish captured from all five lakes.

From Fig. 26 it is apparent that the highest levels of mercury

were measured in liver tissue of lake trout. The median level of mercury in liver tissue of lake trout was 2.55 mg/kg and ranged from 1.1 mg/kg to an extremely high level of 10.2 mg/kg found in liver tissue sampled from a 5.0 kg female lake trout caught in Lac Brule. Median levels of mercury were only slightly higher in muscle tissue (0.793 mg/kg) than in female gonadal tissue (0.593 mg/kg). Median levels of mercury in the liver tissue of lake whitefish were higher (0.64 mg/kg) than in muscle tissue (0.145 mg/kg) and in gonadal tissue (0.098 mg/kg). A maximum level of 0.313 mg/kg was measured in gonadal tissue of a male lake whitefish weighing 2.6 kg sampled from Lac Brule. A maximum level of 1.7 mg/kg mercury was measured in the liver tissue of a 2.0 kg male lake whitefish taken from Lac Brule. Mercury levels in the muscle tissue of lake whitefish ranged from 0.067 mg/kg to 0.700 mg/kg with a median level of 0.145 mg/kg in lake whitefish having body weight ranging from 0.3 to 3.5 kg.

In the muskie captured in Lac Fonteneau, mercury levels in gonadal tissue of two female fish weighing 0.7 and 0.9 kg ranged from 0.05 to 0.10 mg/kg, in liver tissue from one female fish weighing 0.9 kg it was 0.16 mg/kg and in muscle tissue of three female fish it ranged from 0.21 mg/kg to 1.00 mg/kg (median 0.41 mg/kg).

In northern pike, the median level of mercury was highest in muscle tissue (0.390 mg/kg) with liver tissue having slightly lower levels (median 0.274 mg/kg) and gonadal tissue containing the

lowest levels (median 0.213 mg/kg). The highest level measured in the muscle tissue of northern pike was 0.900 mg/kg in a 1.5 kg female captured in Lac Donquan. The highest level of mercury in the liver tissue of northern pike was 1.36 mg/kg measured in liver tissue from a 5.5 kg male pike captured in St. Augustin Lake. In gonadal tissue of northern pike, the highest level was 1.97 mg/kg measured in male gonadal tissue from a 6.5 kg pike captured in St. Augustin Lake.

Mercury levels in ouananiche (captured only in Lac Brule) were highest in liver tissue (0.47 to 1.13 mg/kg), with a median level of 0.55 mg/kg, somewhat lower in muscle tissue (0.189 to 0.770 mg/kg) with a median level of 0.310 mg/kg and lowest in gonadal tissue (all females) ranging from 0.060 to 0.460 mg/kg with a median level of 0.124 mg/kg. The highest level measured in both muscle and liver tissue from this species was found in a 4.1 kg female.

In white suckers median levels of mercury were nearly the same in gonadal tissue (0.280 mg/kg in 5 samples) and muscle tissue (0.206 mg/kg in 30 samples), but lower in liver tissue (0.090 mg/kg in 5 samples). The highest levels measured in all three types of tissue, 0.861 mg/kg, 0.580 mg/kg and 1.73 mg/kg in gonadal, liver and muscle tissue respectively were all measured in white suckers captured from St. Augustin Lake.

In longnose suckers, captured only in St. Paul Lake, mercury

levels were only measured in muscle tissue, and were found to range from 0.030 to 0.450 mg/kg with a median level of 0.195 mg/kg. The highest level found (0.450 mg/kg) was measured in a 1.55 kg female longnose sucker.

In speckled trout, mercury levels were measured only in muscle tissue, and levels were found to range from 0.020 to 1.93 mg/kg with a median level of 0.050 mg/kg. The highest level of mercury found in the muscle tissue of this species (1.93 mg/kg) was found in a 0.45 kg female captured in St. Augustin Lake. All fish of this species captured in St. Augustin Lake had higher levels of mercury than their counterparts captured in St. Paul Lake. Mercury levels as high as 1.93 mg/kg in muscle tissue of speckled trout, 1.88 mg/kg in lake trout, 1.00 mg/kg in muskie, 0.77 mg/kg in ouananiche and 0.70 mg/kg in lake whitefish were measured in fish captured from the five lakes.

Mercury levels in the edible portions (muscle tissue) of many of the species of freshwater fish commonly fished for food in Labrador often exceed the recommended level of mercury for fish commercially sold and intended for human consumption in Canada (0.5 mg/kg) established by the Department of National Health and Welfare. The occurrence of abnormally high levels of mercury in some species of Labrador fish has been known for some time. After a preliminary survey of several fish species from the Smallwood Reservoir in western Labrador in 1976 showed signs of mercury contamination, the Department of Fisheries and Oceans undertook a

two year study to investigate the mercury content of Labrador freshwater and anadromous fishes. (Bruce et al., 1979). During the summer of 1977 and 1978, freshwater and anadromous fishes were sampled from 88 locations throughout Labrador with particular emphasis on the Smallwood Reservoir. In addition to 38 locations within the Smallwood Reservoir, several species of freshwater fish were also sampled from areas which serve as recreational fishing sites for residents of population centers such as Churchill Falls, Wabush-Labrador City, Happy Valley - Goose Bay and selected river systems supporting fly-in sport fishing camps. Included were fish from Lac Gaffaret, which lies in the Natashquan river basin approximately 26 km north-northeast of Lac Fonteneau, Lac Fourmont which lies in the Little Mecatina river basin immediately upstream of Lac Donquan, and from a lake in the St. Paul river basin immediately adjacent to St. Paul Lake.

To get some perspective of where the levels of mercury measured in the muscle tissue of the various species of fish captured in these five lakes in southern Labrador fall with respect to the levels found in the more extensive Department of Fisheries and Oceans survey, it is useful to look at the cumulative frequency distributions of the occurrence of mercury in muscle tissue of the various species sampled. Figs. 34 to 40 show the cumulative relative frequency of occurrence of mercury in muscle tissue of lake trout, northern pike, lake whitefish, ouananiche, white suckers, longnose suckers and speckled trout - respectively sampled during the DFO survey. Also indicated on the graphs are the

minimum, median and maximum mercury levels measured in muscle tissue of fish of each species captured from the five lakes surveyed in southern Labrador.

The cumulative relative frequency curves for mercury levels measured by DFO in their survey of Labrador fish indicate the following with respect to the levels of mercury measured in muscle tissue of the different species sampled from the five lakes. Although the highest levels (median) of mercury in muscle tissue were measured in lake trout (captured in Lac Donquan and Lac Brule), the median level measured in lake trout from the two lakes (0.793 mg/kg) was slightly lower than the median level (0.81 mg/kg) in lake trout captured from forty-one locations in Labrador during the DFO survey. The maximum level (1.88 mg/kg) measured in a 4.0 kg lake trout from Lac Brule was near the 90th percentile of levels measured in the DFO survey.

The median level of mercury measured in muscle tissue of northern pike captured from the five southern Labrador lakes (0.39 mg/kg) was much lower than the median mercury level (0.84 mg/kg) in muscle tissue of northern pike sampled from forty-one locations in Labrador by the Department of Fisheries and Oceans, and the maximum level, 0.90 mg/kg, measured in muscle tissue of a 1.5 kg fish captured in Lac Donquan was exceeded in approximately 43% of the samples analyzed by DFO.

The median concentration of mercury in muscle tissue of lake

whitefish from Lac Donquan and Lac Brule (0.145 mg/kg) is much lower than the median concentration (0.38 mg/kg) measured in the 302 samples of lake whitefish analyzed by the DFO. However, the maximum level of 0.7 mg/kg measured in the muscle tissue of a 0.9 kg lake whitefish from Lac Brule was exceeded in only about 6% of the samples analyzed by DFO.

The median level of mercury in muscle tissue of ouananiche (0.31 mg/kg) captured in Lac Brule is somewhat higher than the median level (0.20 mg/kg) measured in the muscle tissue of ouananiche sampled from sixteen locations in Labrador during the DFO survey, and the maximum level of mercury (0.77 mg/kg) measured in the muscle tissue of a 4.1 kg ouananiche from Lac Brule was exceeded in only about 10% of the samples analyzed by DFO.

The median level of mercury (0.206 mg/kg) measured in the muscle tissue of white suckers captured in Lac Fonteneau, Lac Brule, St. Augustin and St. Paul Lakes is somewhat higher than the median level (0.12 mg/kg) measured in white suckers sampled from thirty-seven locations in Labrador during the DFO survey, and the highest level (1.73 mg/kg) measured in a 0.5 kg white sucker from St. Augustin Lake was much higher than the maximum level of 0.90 mg/kg measured in 429 samples collected during the DFO survey. This is interesting, bearing in mind that the bottom sediments of St. Augustin Lake appear to be naturally mercury enriched.

The median level of mercury (0.195 mg/kg) measured in the

muscle tissue of longnose suckers, which were captured only in St. Paul Lake, is slightly lower than the median level (0.27 mg/kg) measured in longnose suckers captured from forty-three locations in Labrador during the DFO survey. The maximum level measured in muscle tissue of longnose suckers from St. Paul Lake (0.45 mg/kg) was exceeded in approximately 28% of the samples analyzed by the DFO.

The median level of mercury in muscle tissue of speckled trout captured in St. Augustin and St. Paul Lakes (0.050 mg/kg) was much lower than the median level measured by DFO (0.40 mg/kg) in muscle tissue of speckled trout sampled from twenty-four locations in Labrador. However, the highest level (1.93 mg/kg) measured in a 0.45 kg speckled trout captured in St. Augustin Lake exceeded the maximum level of 1.54 mg/kg measured in 140 samples of speckled trout by the DFO.

Fig. 41 shows the relative levels of mercury in muscle tissue (based upon median of samples) of six different species of fish captured from the five lakes compared to mercury levels in the muscle tissue of lake trout. On average, the highest levels of mercury were measured in lake trout, probably because they are long-lived predators. The next highest levels were measured in northern pike, ouananiche, white and longnose suckers, lake whitefish and speckled trout in that order. The highest levels of mercury appear to occur in species which are fish eaters, and levels gradually increase with trophic level of the fish.

As suggested by others (Johnels et al., Potter et al., 1975), certain patterns of concentration of mercury occur between tissue types in some fish. Fig. 42 shows the relative levels of mercury in the three different types of tissue (based on mean of samples) for fish belonging to the family Salmonidae (lake trout, lake whitefish and ouananiche) compared to the relative levels in fish belonging to other families of fish - Esocidae (northern pike) and Catostomidae (white suckers).

In fish of the family Salmonidae, mercury levels in the highly vascularized liver tissue were over 4.5 times higher than in muscle tissue, and about 1.5 times higher in gonadal tissue than in muscle tissue. Mercury levels in gonads, liver and muscle tissue of fish belonging to the other families were similar.

The ratio of mean mercury content of nonmuscle tissue to muscle tissue suggests that the pattern of accumulation in different body tissues differs between species, with fish belonging to the family Salmonidae accumulating the highest levels in liver tissue.

Cadmium

Fig. 27 shows the median and range of cadmium measured in gonads, liver and muscle tissue of eight species of fish captured from the five lakes. The highest levels were measured in the

livers of lake trout, lake whitefish and white suckers with median levels of 0.16 mg/kg, 0.45 mg/kg and 0.22 mg/kg respectively. One outlying high value of 1.4 mg/kg was measured in the liver tissue of a 2.5 kg white sucker captured in Lac Brule. The median level (0.16 mg/kg) measured in liver tissue of lake trout from Lac Brule is higher than the mean level of 0.06 $\pm$ 0.2 ppm reported for cadmium levels in livers of lake trout sampled from Lake Michigan by Lucas et al. The median level (0.45 mg/kg) measured in liver tissue of lake whitefish is only slightly higher than the 0.3 $\pm$ 0.1 ppm mean level of cadmium in the liver of lake whitefish sampled from Lake Superior and reported by Lucas et al. Cadmium in livers of white suckers ranged from 0.12 mg/kg to 1.4 mg/kg with a median level of 0.22 mg/kg.

Generally, cadmium levels in muscle tissue of all eight fish species sampled were less than the detection limit of the analytical method used to analyze the samples (0.025 mg/kg), but cadmium levels well above the detection limit were measured in muscle tissue samples from a muskie captured in Lac Fonteneau, a lake whitefish captured in Lac Brule, a speckled trout and two white suckers captured in St. Augustin Lake, and from two longnose suckers captured in St. Paul Lake.

Cadmium levels in gonadal tissue were generally lower than in liver tissue for the six species in which it was measured in both types of tissue, but slightly higher than in muscle tissue. Levels as high as 0.13 mg/kg in gonadal tissue (male) of northern pike,

0.08 mg/kg in gonadal tissue (female) of lake trout, 0.06 mg/kg in female gonadal tissue of lake whitefish, 0.05 mg/kg in female gonadal tissue of ouananiche and 0.04 mg/kg in female gonadal tissue of white suckers were measured.

Copper

Generally, copper levels were highest in the liver tissue of all the fish species captured. The highest median levels were in liver tissue of ouananiche (35.5 mg/kg). The highest level measured in liver tissue of this species was 60.0 mg/kg measured in liver tissue from a 4.9 kg female ouananiche captured in Lac Brule. The next highest median level of copper in liver tissue was measured in lake trout (22.0 mg/kg) and copper levels in liver tissue of this species varied widely (from 1.3 mg/kg to 43.0 mg/kg) with no apparent correlation with body weight or fork length of the fish.

Median copper level in liver tissue from northern pike was 10.5 mg/kg, and here again levels varied widely, from 4.30 mg/kg in liver tissue from a 4.3 kg northern pike captured in Lac Fonteneau to 38.0 mg/kg in a 5.5 kg fish from St. Augustin Lake. No significant correlation was found between levels of copper in liver tissue and body weight or fork length of the fish.

Median copper levels in white suckers and lake whitefish livers were lowest, 6.4 mg/kg and 5.1 mg/kg respectively, with

levels ranging from 2.5 mg/kg to 23.7 mg/kg in white sucker livers and from 2.8 mg/kg to 18.0 mg/kg in lake whitefish livers. The median level of copper in livers of lake trout (22.0 mg/kg) lies between the mean level of copper in livers of lake trout captured in Lake Michigan (21 ± 10 ppm) and in those captured from Lake Superior (28 ± 8 ppm) reported by Lucas et al. (1970). The median level of copper in livers of lake whitefish (5.1 mg/kg) lies between the mean level of copper in livers of lake whitefish captured in Lake Superior (2.4 ± 0.1 ppm) and in those captured from Lake Michigan (8.5 ± 2.5 ppm) and reported by Lucas et al. (1970).

Generally, copper levels in gonadal tissue were much lower than in liver tissue, the exception being in female gonadal tissue from ouananiche where the median copper level was 22.5 mg/kg. Copper concentrations in female gonadal tissue from ouananiche varied widely, from 4.2 mg/kg to 26.0 mg/kg with no significant correlation between copper concentrations in gonadal tissue and body weight or fork length of the fish. Median copper levels in lake trout gonadal tissue were much lower than in ouananiche (3.0 mg/kg) and varied from 0.3 mg/kg in female gonadal tissue from a 5.8 kg lake trout captured in Lac Donquan to 5.6 mg/kg in a female lake trout weighing 8.5 kg captured in Lac Brule. Median copper levels in gonadal tissue from the remainder of the species captured (lake whitefish, muskie, northern pike and white suckers) were in the order of 1 mg/kg, with the highest level being 1.6 mg/kg in a 2.5 kg white sucker captured in St. Augustin Lake.

Generally, copper concentrations in muscle tissue of all eight species captured were less than 1.0 mg/kg and often only slightly above the 0.200 mg/kg detection limit of the analytical method used to analyze the samples. Two outlying results were measured in muscle tissue from a 5.8 kg lake trout captured in Lac Donquan (5.0 mg/kg) and in a 0.7 kg muskie captured in Lac Fonteneau (25.00 mg/kg).

Lead

Median lead concentrations in the gonads, liver and muscle tissue of most of the species captured were less than the detection limit of the analytical method employed to analyze the samples (0.050 mg/kg) with the exception of gonadal tissue from lake trout, where the median level (0.055 mg/kg) was only slightly above the detection limit, and liver and muscle tissue of white suckers, where the median level of 0.060 mg/kg was not significantly above the detection limit. However, much higher concentrations of lead were often measured in individual samples of gonadal, liver and muscle tissue from many of the species captured. One sample of male gonadal tissue from a 6.5 kg northern pike captured in St. Augustin Lake was found to have a lead concentration of 0.35 mg/kg, and muscle tissue from a 1.8 kg speckled trout captured in St. Paul Lake was found to have a lead concentration of 0.34 mg/kg.

Zinc

Zinc concentrations in liver and gonadal tissue from most species were much higher than in muscle tissue. Median zinc levels in liver tissue ranged from 29.0 mg/kg in white suckers to 40.5 mg/kg in northern pike and 42.0 mg/kg in lake whitefish. One sample of liver tissue from a 3.75 kg lake trout captured in Lac Brule had a zinc content of 60.0 mg/kg. Liver tissue from a 4.3 kg northern pike captured in Lac Fonteneau was found to have a zinc concentration of 210.0 mg/kg, and from a 3.0 kg northern pike captured in Lac Brule was found to have a level of 123.0 mg/kg.

The levels found in liver tissue of lake whitefish (median 42.0 mg/kg) are nearly an order of magnitude higher than the mean level (23 $\pm$ 1 ppm) reported for concentrations of zinc in liver tissue of lake whitefish captured from Lake Superior by Lucas et al. (1970). Although only one sample of liver tissue from lake trout was analyzed for zinc, the level found (60.0 mg/kg) is somewhat higher than the mean level of 48 $\pm$ 12 ppm reported by Lucas et al. (1970) for lake trout from Lake Superior.

Zinc concentrations in gonadal tissue were highest in female ouananiche, ranging from 91.0 mg/kg to 122.0 mg/kg. In lake whitefish, zinc concentrations in gonadal tissue varied widely, with female tissue appearing to have higher levels (50.0 mg/kg to 135.0 mg/kg) than male tissue (14.0 to 17.0 mg/kg).

Median zinc concentrations in muscle tissue ranged from 6.0

mg/kg in speckled trout to 12.0 mg/kg in lake trout. Highest levels measured in muscle tissue were 57.0 mg/kg in speckled trout, 43.0 mg/kg in white sucker and 37.0 mg/kg in lake trout.

Aluminum

Median concentrations of aluminum were generally highest in liver tissue, although they were below the detection limit of the analytical method used (2.0 mg/kg) in the case of northern pike and ouananiche livers. Median concentrations of aluminum in liver tissue ranged from 7.0 mg/kg in lake whitefish to 5.0 mg/kg in white suckers and 4.1 mg/kg in lake trout. High levels of 33.0 mg/kg and 30.0 mg/kg were measured in liver tissue samples from lake whitefish and white suckers respectively.

Generally, gonadal tissue from all of the species captured had aluminum concentrations below the detection limit of the analytical method, although tissue samples from individual fish had levels as high as 36.0 mg/kg in white suckers, 16.0 mg/kg in lake whitefish, 11.0 mg/kg in northern pike and 9.6 mg/kg in lake trout.

In muscle tissue, median concentrations of aluminum were generally below the detection limit of 2.0 mg/kg, except in the case of white suckers (3.45 mg/kg), longnose suckers (3.40 mg/kg) and speckled trout (2.8 mg/kg). Levels as high as 16.0 mg/kg were measured in muscle tissue from longnose suckers and 7.0 mg/kg in tissue from white suckers.

Nickel

Concentrations of nickel in all tissue types of most species caught were below the analytical detection limit (0.05 mg/kg), except in the case of longnose suckers from St. Paul Lake where the median level in muscle tissue was 0.10 mg/kg. Levels as high as 0.66 mg/kg were measured in muscle tissue from this species. Liver tissue from two white suckers captured in Lac Brule had concentrations of nickel (0.72 mg/kg and 1.10 mg/kg) well above the detection limit of the analytical method.

Chromium

Chromium concentrations in all of the fish tissue samples analyzed were at or below the detection limit of the analytical method (0.2 mg/kg) with the exception of three liver tissue samples from white suckers captured in Lac Brule, where the concentration of chromium was 2.4 mg/kg, 4.1 mg/kg and 5.1 mg/kg.

The role of many of these trace metals in the biosphere is complex and not fully understood. At less than toxic concentrations, many trace elements are essential to the physiological function of the organism, and metal concentrations in fish tissues reportedly increase or decrease with exposure or are controlled by some homeostatic process (Goodyear and Boyd 1972; Cearley and Coleman, 1974). Low concentrations of essential trace

elements may supress physiological action, and the difference in concentration between deficiency and toxicity is often small. Fish are known to contain the metal-binding protein metalothionein, and the detoxification of some of the metals (Cd, Hg, Cu) in fish liver has been suggested by one author (Friberg et al. 1971) to be a sequestration rather than an elimination process. If the higher levels of these metals in liver tissue represent a net effect of detoxification by sequestration, then increasing concentrations of these metals in liver tissue may represent storage of sequestered metal in that organ. For this reason, fish can act as indicators of levels in the environment, and are excellent organisms for the study of some long-term changes in trace metals in the environment. Presumably the levels of metals found in the various organs of the different species of fish captured in these five lakes represent the "natural" background levels of these metals in fish of these species in eastern Canadian Shield lakes.

Chlorinated Hydrocarbon Pesticide and PCB Residues in Fish Tissue

Fish tissue samples from fish captured in all five lakes were analyzed for a range of chlorinated hydrocarbon pesticide and PCB residues. Table 22 lists the compounds which were measured, the corresponding NAQUADAT Code and the detection limit of the analytical method. Table 23 lists the raw data for compounds which were detected in at least some of the samples.

In addition to the compounds listed in Table 22, fish tissue

samples were also analyzed for the compounds listed in Table 24 and were found to have non-detectable concentrations of these residues. Table 24 also indicates the detection limit of the analytical method used to analyze for the various compounds, and the total number of tissue samples analyzed.

The residues which were found at measurable concentrations in fish tissue were those of DDT (1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane), the alpha and gamma isomers of hexachlorocyclohexane (alpha-BHC and gamma-BHC) and polychlorinated biphenyls (PCBs).

DDT is a notorious pesticide whose environmental hazards have been well documented. Its use was banned in the U.S. and Canada in 1972, and the concentrations and fluxes of DDT and its metabolites have been documented as decreasing in several environmental compartments since then. However, it is an inexpensive pesticide still used in many underdeveloped parts of the world, and its residues are known to be globally distributed. Rapaport et al., (1985) have recently used the measurement of untransformed (p,p'- and o,p'-) DDT in rain, snow and peat samples to indicate that the input of "new" DDT continues over a large portion of eastern North America.

The parent compound DDT, when absorbed in living organisms is metabolized mainly to DDD and DDE analogues, which are especially persistent both chemically and with respect to further metabolic

degradation.

Figs. 43 to 46 indicate the median and range of concentrations of T-DDT and its analogues o,p'-DDT, p,p'-DDE and p,p'-DDD in the various tissues of several species of fish captured from the five southern Labrador lakes.

The untransformed analogue p,p'-DDT was not detected in any of the fish tissue samples (detection limit 0.001 mg/kg) and the o,p'-DDT analogue was also below detection limit (0.001 mg/kg) in the vast majority of samples analyzed (83% of 228 samples). However, o,p'-DDT was measured at the detection limit in a number of samples of all tissue types from most of the species caught. The highest level measured was 0.031 mg/kg in liver tissue of a 5.25 kg northern pike captured in St. Augustin Lake. Concentrations of the o,p'-DDT analogue as high as 0.006 mg/kg in muscle tissue and 0.005 mg/kg in gonadal tissue were also measured in a 13.0 kg female lake trout captured in Lac Brule.

The p,p'-DDD analogue was also below detection limit in 192 samples of 228 analyzed. However, it was detected in a few samples of lake trout gonadal, liver, heart and muscle tissue, with the highest concentrations being in a 13.0 kg lake trout captured in Lac Brule. Concentrations of p,p'-DDD were 0.050 mg/kg, 0.014 mg/kg, 0.013 mg/kg and 0.006 mg/kg in liver, muscle, gonadal and heart tissue respectively of this fish. Concentrations as high as 0.027 mg/kg of this metabolite of DDT were also measured in

northern pike livers.

The most frequently occurring measurable concentrations of DDT residues were of the transformed p,p'-DDE analogue, and measurable concentrations of this analogue accounted for 50 to 100 % of total DDT measured in the samples. The highest concentrations of this analogue of DDT were measured in liver, muscle, gonad and heart tissue of a 13.0 kg lake trout captured in Lac Brule. Concentrations of this metabolite of DDT were 0.82 mg/kg, 0.44 mg/kg, 0.22 mg/kg and 0.14 mg/kg in liver, muscle, gonadal and heart tissue respectively of this fish.

Lake trout are both long lived and autumn spawners and other investigators (Johnson, 1968) have noted high levels of p,p-DDE in the eggs of female lake trout. Lake trout sampled from forty-one locations in Labrador by the Department of Fisheries and Oceans in 1977-1978 (Bruce et al., 1979) were aged and found to range up to 39 years old. The 13.0 kg and 14.0 kg lake trout captured in Lac Brule are heavier than any of the lake trout captured during this survey, the heaviest fish being 12.0 kg captured in Shebogamo Lake (part of the Smallwood Reservoir) which was determined to be 18 years old.

The highest concentration of T-DDT (sum of analogue concentrations) measured in the edible portions of fish (muscle tissue) were 0.483 mg/kg in lake trout and 0.065 mg/kg in northern pike. These levels are well below the accepted U.S. and Canadian

guideline of 5.0 mg/kg total DDT in fish for human consumption.

Fig. 47 shows the median and range of alpha-BHC concentrations measured in the four different types of tissue from seven species of fish captured in the five lakes. Consistently higher concentrations were measured in the gonads of lake whitefish (7 samples ranging from <0.001 mg/kg to 0.014 mg/kg with a median level of 0.010 mg/kg) and in livers of lake trout, lake whitefish and white suckers. The highest concentration of alpha-BHC measured was 0.033 mg/kg in the liver tissue of a lake trout from Lac Brule. Concentrations as high as 0.015 mg/kg and 0.005 mg/kg were also measured in livers of northern pike and white suckers captured in Lac Brule. Concentrations of alpha-BHC in muscle tissue of all the species sampled were generally below the detection limit of the method used (0.001 mg/kg) and never exceeded 0.002 mg/kg. The higher concentrations of alpha-BHC in fish tissue were all measured in fish from Lac Brule, where higher concentrations of this compound were also measured in water samples.

Gamma-BHC (Lindane) was also measured, at the detection limit of the analytical method (0.001 mg/kg) in a number of samples of gonad, liver, heart and muscle tissue from lake trout, northern pike, ouananiche, lake whitefish, and white suckers captured in Lac Brule. The highest level of this compound measured was 0.003 mg/kg in liver tissue of a 3.75 kg northern pike. Significantly, the only fish in which this compound was detected were captured from Lac Brule, which was the only lake in which gamma-BHC was detected

in water samples (0.001 ug/L to 0.002 ug/L).

Lindane (gamma-BHC) is known to bioaccumulate in the food chain, and it has been recommended (Great Lakes Water Quality Board, 1974) that Lindane in water should not exceed 0.010 ug/L for the protection of aquatic life. The alpha-BHC isomer is recognized as being more persistent, but less toxic, than the gamma-BHC isomer (Gummer, 1979).

However, the levels of Lindane and alpha-BHC found in fish tissue sampled from the five lakes are well below the levels reported by the Alberta Department of Agriculture, 1977 - 0.734 mg/kg Lindane and 0.150 to 0.282 mg/kg alpha-BHC (Gummer, 1979).

Fig. 48 shows the concentration of PCBs measured in the different types of tissue sampled from seven species of fish captured in the five lakes. Consistently higher levels of PCBs were measured in all types of tissue sampled from lake trout, with the highest levels being in liver tissue (median 0.110 mg/kg). Levels as high as 0.210 mg/kg and 0.150 mg/kg were measured in liver and gonadal tissue respectively from the 13.0 kg lake trout captured in Lac Brule. The highest concentration measured was 2.2 mg/kg in liver tissue from a 1.5 kg northern pike captured in Lac Donquan. The highest concentration of PCBs found in edible portions (muscle tissue) of all the fish captured from the five lakes was 0.100 mg/kg in the 13.0 kg female lake trout captured in Lac Brule, well below the Health and Welfare Canada guideline of

2.0 mg/kg PCB in fish for human consumption.

Generally, the level of PCBs found in the livers of fish captured in all five lakes is well below the levels found by Musial et al., 1979, in the liver tissue of burbot (Lota lota) captured in a general area of Smallwood reservoir in southwestern Labrador upstream of the Churchill Falls hydro-electric dam. Burbot liver tissue sampled during the summer of 1977 was found to contain from 0.040 mg/kg to 1.11 mg/kg PCB with a mean value of 0.51 mg/kg in 22 samples. The outlying value of 2.2 mg/kg PCB found in the liver tissue of northern pike sampled from Lac Donquan exceeds this level, and although no source of sample contamination in the field or laboratory could be identified, the value is anomalous and should be viewed as suspect until more data become available on the levels of PCBs in liver tissue of northern pike in Labrador.

Because many of the analogues of DDT and the higher chlorinated PCB congeners are known to have lipophilic characteristics, % lipid determinations were made on samples of fish tissue collected from St. Augustin and St. Paul Lakes. The lipid content (%) of each of the tissue types of northern pike, white suckers, longnose suckers and speckled trout sampled from the two lakes is shown in Table 23. Fig. 49 shows the median and range of lipid content in the three tissue types sampled from the four species (only northern pike gonads, northern pike and white sucker livers were sampled).

Generally, liver tissue samples were found to have much higher lipid content than either gonadal or muscle tissue. Gonadal tissue, although much lower in lipid content than liver tissue, was found to have slightly higher lipid content than muscle tissue. The distribution of T-DDT, p,p'-DDE, alpha-BHC and PCB concentrations among the three tissue types of most of the fish sampled followed this general trend, with the highest concentrations in liver tissue, the next highest concentrations in gonadal tissue, and the lowest concentrations in muscle tissue. Figs. 50 to 52 show the relationships between concentrations of alpha-BHC, T-DDT and PCBs and % lipid for all samples of fish tissue sampled from St. Augustin and St. Paul Lakes. The figures indicate a better relationship between lipid content and alpha-BHC concentrations than between lipid content and T-DDT or PCB concentrations.

The measurable concentrations of the residues of DDT, alpha-BHC and PCB's in fish tissue from these five lakes, although well below levels which would pose any threat to human consumption, are interesting in that they indicate that these compounds are reaching, or have reached these remote northern lakes in the past, presumably through long-range transport in the atmosphere.

SUMMARY

The chemistry of all five lakes indicate very soft oligotrophic waters which contain no detectable levels of inorganic contamination. The differences in water color between the five lakes is probably due to dissolved humic substances, which is in turn probably related to the proportion of bog in the drainage basins of the lakes. Water color in the five lakes correlates very well with extractable iron in the lake waters, and this is probably due to the ability of humic acids to complex with iron in the ferric state.

The only organic contaminant detected in the lake waters was alpha-BHC and gamma-BHC, which probably reach these remote areas through long-range transport in the atmosphere.

The bottom sediments of the five lakes contain widely differing concentrations of total mercury, probably the result of differing land forms and geological structures in their drainage basins, and because of significant differences in lake morphometry. The higher levels of mercury in bottom sediments (above an arbitrarly defined limit of 0.1 mg/kg) were found in headwater lakes, while river expansion lakes exhibited lower levels. In one of the lakes where mercury concentrations in bottom sediments ranged from <0.020 mg/kg to 0.130 mg/kg, total mercury was found to correlate very well with % total organic carbon in the bottom sediments. It is hypothesized that this tendency of mercury to

associate with the organic fraction of sediment accounts for the differing levels of this element found in the bottom sediments of the five lakes.

Low levels of the transformed analogue of DDT (p,p'-DDE) were detected in the bottom sediments of three of the lakes, and PCB residues were found at measurable concentrations in the bottom sediments from one lake.

The edible portion of fish (muscle tissue) of species commonly fished for food often contain levels of mercury in excess of that recommended by Health and Welfare Canada. In general, mercury in muscle tissue of fish from the five lakes was found to increase with trophic level, with the highest levels in fish eaters - lake trout and northern pike.

The pattern of distribution of mercury concentrations in fish tissue was found to differ among species, with fish belonging to the family Salmonidae accumulating the highest levels in liver tissue.

The levels of mercury measured in the muscle tissue of fish of all species captured in the five lakes were found to fall within the range of levels measured by the Department of Fisheries and Oceans in a more extensive survey of mercury in Labrador fresh water fishes in 1977-1978, with the exception of mercury concentration in the muscle tissue of white suckers and speckled

trout. The higher levels of mercury in the muscle tissue of these two species were measured in fish captured from St. Augustin Lake, which was also found to have the highest levels of mercury in bottom sediments.

Even in this comparatively remote area of the country, fish tissue samples from all of the lakes contain low levels of several fat soluble organic pollutants which have been found to be global in distribution. Measurable concentrations of alpha-BHC, DDT and PCB residues were found in a significant number of liver, gonadal and muscle tissue samples from all species of fish captured in the five lakes. The concentrations of all of these compounds were found to correlate with % lipid content of fish tissue, and the pattern of distribution of concentrations in the different types of fish tissue seems to be governed by their liphophilic characteristics.

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TABLE 1. Stations sampled in Lac Donquan - September 1980

NAQUADAT STA. NO.	LOCATION	LATITUDE	LONGITUDE	DATE SAMPLED
01NF02XA0005	Lac Donquan at inlet of Little Mecatina River.	52 00' 56"	60 17' 06"	19/09/80
51NF02XA0001	" " " " (water depth 1.0 m)	"	"	"
01NF02ZA0002	Lac Donquan 2.0 km S.E. of inlet to Little Mecatina River.	52 00' 24"	60 15" 51"	19/09/80
51NF02XA0002	" " " " (water depth 9.0 m)	"	"	"
01NF02XA0003	Lac Donquan 3.9 km S.E. of inlet to Little Mecatina River.	52 00' 21"	60 13' 48"	19/09/80
51NF02XA0003	" " " " (water depth 11.0 m)	"	"	"
01NF02XA0004	Lac Donquan at outlet.	51 59' 18"	60 12' 51"	19/09/80
51NF02XA0004	" " " " (water depth 1.0 m)	"	"	"
00NF02XA0003	Riviere Joir, 1 km upstream from Little Mecatina River.	51 58' 09"	60 12' 12"	19/09/80
50NF02XA0003	" " " "	"	"	"

TABLE 2. Stations sampled in Lac Fonteneau - September 1981

NAQUADAT STA. NO.	LOCATION	LATITUDE	LONGITUDE	DATE SAMPLED
01NF02MB0004	Lac Fonteneau 320 m north of Labrador-Quebec boundary.	52 00' 30"	61 40' 06"	09/09/81
51NF02MB0004	" " " " (water depth 21.3 m)	"	"	"
01QU02MB0001	Lac Fonteneau 23 km south of Labrador-Quebec boundary.	51 52' 09"	61 27' 58"	09/09/81
51QU02MB0001	" " " " (water depth 10.7 m)	"	"	"
01QU02MB0002	Lac Fonteneau 9.0 km south of Labrador-Quebec boundary.	51 56' 17"	61 34' 54"	09/09/81
51QU02MB0002	" " " " (water depth 14.9 m)	"	"	"
01QU02MB0003	Lac Fonteneau 3.0 km south of Labrador-Quebec boundary.	51 58' 39"	61 38' 56"	09/09/81
51QU02MB0003	" " " " (water depth 26.5 m)	"	"	"

TABLE 3. Stations sampled in Lac Brule' - September 1982

NAQUADAT STA. NO.	LOCATION	LATITUDE	LONGITUDE	DATE SAMPLED
01QU02VC0001	Lac Brule' (Romaine River) approximately 5.5 km down-lake from inflow.	52 20' 22"	63 56' 00"	15/09/82
51QU02VC0001	(water depth 4.6 m)	"	"	"
01QU02VC0002	Lac Brule' (Romaine River) approximately 8.7 km down-lake from inflow.	52 19' 18"	63 53' 20"	16/09/82
51QU02VC0002	(water depth 4.9 m)	"	"	"
01QU02VC0003	Lac Brule' (Romaine River) approximately 18 km down-lake from inflow.	52 15' 37"	63 48' 15"	16/09/82
51QU02VC0003	(water depth 7.6 m)	"	"	"
01QU02VC0004	Lac Brule' (Romaine River) approximately 26 km down-lake from inflow.	52 12' 15"	63 43' 48"	16/09/82
51QU02VC0004	(water depth 3.7 m)	"	"	"

TABLE 4. Stations sampled in St Augustin Lake - September 1983

NAQUADAT STA. NO.	LOCATION	LATITUDE	LONGITUDE	DATE SAMPLED
01NF02XB0002	St. Augustin River headwater lake (unnamed) approximately 0.8 km down-lake from northern end.	52 35' 54"	59 18' 33"	14/09/83
51NF02XB0002	" " " " (water depth 3.0 m)	"	"	"
01NF02XB0003	St. Augustin River headwater lake (unnamed) approximately 1.5 km down-lake from northern end.	52 35' 29"	59 18' 21"	15/09/83
51NF02XB0003	" " " " (water depth 3.1 m)	"	"	"
01NF02XB0004	St. Augustin River headwater lake (unnamed) near center of large eastern bay.	52 35' 10"	59 17' 32"	15/09/83
51NF02XB0004	" " " " (water depth 2.5 m)	"	"	
01NF02XB0005	St. Augustin River headwater lake (unnamed) approximately 0.8 km up-lake from outlet to St. Augustin River.	52 34' 43"	59 18' 50"	15/09/83
51NF02XB0005	" " " " (water depth 3.0 m)	"	"	

TABLE 5. Stations sampled in St Paul Lake - September 1984

NAQUADAT STA. NO.	LOCATION	LATITUDE	LONGITUDE	DATE SAMPLED
01NF02XC0007	St Paul River headwater lake (unnamed) approximately 150 m from lake outlet.	52 25' 31"	58 21' 10"	14/09/84
51NF02XC0007	" " " " (water depth 0.5 m)	"	"	"
01NF02XC0008	St Paul River headwater lake (unnamed) approximately 3 km uplake from outlet near center of large western bay.	52 24' 00"	58 21' 23"	14/09/84
51NF02XC0008	" " " " (water depth 0.75 m)	"	"	"
01NF02XC0009	St Paul River headwater lake (unnamed) approximately 3.2 km uplake from outlet near entrance to southern bay.	52 23' 51"	58 20' 30"	14/09/84
51NF02XC0009	" " " " (water depth 1.0 m)	"	"	"
01NF02XC0010	St Paul River headwater lake (unnamed) approximately 4.5 km uplake from outlet near center of southern bay.	52 23' 19"	58 19' 36"	14/09/84
51NF02XC0010	" " " " (water depth 0.75 m)	"	"	"

TABLE 6. Physical characteristics of five southern Labrador lakes.

	Lac Donquan	Lac Fonteneau	Lac Brule	St Augustin Lake	St Paul Lake
Surface Area (sq km)	14.5	51.0	95.0	5.6	7.0
Drainage Area (sq km)	8210.	635.	2820.	30.	80.7
Rel Drainage Area	0.0018	0.0803	0.0337	0.1867	0.0867
Max Length (km)	6.4	43.3	25.0	3.8	5.3
Max Width (km)	5.6	1.9	6.4	2.3	1.9
Sampling station mean de	5.6	18.4	5.2	2.9	0.75
Elevation of Surface (m)	280	399	480	452	357
Lake Type	River Expansion	Headwater Lake	River Expansion	Headwater Lake	Headwater Lake

TABLE 7. Major ions and metals in five southern Labrador lakes.

STATION NO.	YEAR SAMPLED	SAMPLING TEMP	SP. COND. FIELD	SP. COND. LAB	COLOR (UNITS)	Ca (mg/l)	Fe (mg/l)	TURBIDITY (J.T.U.)	Mg (mg/l)	K (mg/l)
01NF02XA0005	1980	9.0	12	13.3	40	1.40	0.44	0.6	0.38	
01NF02XA0002	1980	9.5	12	13.8	40	1.40	0.39	0.5	0.38	
01NF02XA0003	1980	10.0	12	13.2	40	1.40	0.38	0.4	0.38	
01NF02XA0004	1980	11.0	12	13.2	30	1.40	0.42	0.4	0.38	
00NF02XA0003	1980	9.8	15	15.0	40	1.60	0.57	0.4	0.42	
01QU02WB0003	1981		12		20	1.00	0.14	0.3	0.25	0.1
01QU02WB0001	1981	14.5	12		15	1.00	0.11	0.3	0.25	0.4
01NF02WB0004	1981	14.0	12		20	1.05	0.16	0.4	0.25	0.1
01QU02WB0002	1981	14.5	12		20	1.00	0.11	0.3	0.25	0.2
01QU02VC0001	1982	10.5	8	12.1	20	1.30	0.21	0.6	0.35	0.1
01QU02VC0002	1982	10.8	8	12.5	20	1.30	0.21	0.6	0.37	0.6
01QU02VC0003	1982	10.9	8	12.2	20	1.30	0.21	0.6	0.35	0.4
01QU02VC0004	1982	10.3	7	12.2	20	1.35	0.16	0.8	0.35	0.3
01NF02XB0002	1983	7.5	10	11.8	15	1.10	0.15	0.7	0.40	0.2
01NF02XB0003	1983	8.0	10	12.1	15	1.10	0.15	0.6	0.43	0.2
01NF02XB0004	1983	8.0	7	12.1	15	1.10	0.15	0.6	0.43	0.1
01NF02XB0005	1983	8.0	8	12.2	15	1.10	0.14	0.6	0.43	0.1
01NF02XC0007	1984	8.5	12	9.7	50	0.90	0.71		0.23	0.1
01NF02XC0008	1984	9.2	7	9.0	70	0.86	0.92		0.22	0.1
01NF02XC0008	1984	9.2	7	8.5	70	0.83	0.89		0.21	0.1
01NF02XC0008	1984	9.2	7	8.3	70	0.81	1.10		0.21	0.2
01NF02XC0009	1984	9.2	8	8.7	60	0.82	0.78		0.21	0.1
01NF02XC0010	1984	8.8	7	8.4	70	0.80	0.83		0.21	0.1

TABLE 7. Major ions and metals in five southern Labrador lakes.

STATION NO.	Na (mg/l)	pH LAB	pH FIELD	Cl (mg/kg)	SO4-MTB (mg/l)	SO4 (IC) (mg/l)	TOC (mg/l)	DOC (mg/l)	TOTAL N. (mg/l)	DISS NO2+NO3	T. PHOS (mg/l)	HUMIC ACIDS
01NF02XA0005	0.7	6.4	5.9	0.4	2.5		6.5		0.27	(0.01	0.008	4.1
01NF02XA0002	0.7	6.4	5.9	0.3	2.3		9.0		0.11	(0.01	0.008	4.4
01NF02XA0003	0.7	6.7	6.1	0.4	2.3		6.5		0.20	(0.01	0.012	4.1
01NF02XA0004	0.7	6.7	6.1	0.4	2.3		9.5		0.16	(0.01	0.014	3.7
00NF02XA0003	0.7	6.6	6.1	0.5	2.7		9.0		0.21	(0.01	0.013	4.9
01GU02WB0003	0.6		6.2	0.3	2.0							
01GU02WB0001	0.6		6.2	0.4	1.8							
01GU02WB0004	0.6		6.0	0.3	2.0							
01GU02WB0002	0.6		6.0	0.4	1.8							
01GU02VC0001	0.6	6.4	5.7	(0.5	1.9			3.9	0.30	(0.01		
01GU02VC0002	0.5	6.5	5.8	(0.5	2.0			4.3	0.26	(0.01	0.021	
01GU02VC0003	0.4	6.6	5.9	(0.5	1.9			4.3	0.35	(0.01	0.004	
01GU02VC0004	0.4	6.6	5.9	(0.5	1.9			3.8	0.66	(0.01	0.003	
01NF02XB0002	0.5	5.9		0.5	1.5	0.9		3.6	0.08	(0.01		
01NF02XB0003	0.5	5.8		0.5	1.5	0.9		4.0	0.08	(0.01		
01NF02XB0004	0.5	5.9		0.5	1.5	0.9		4.0	0.07	(0.01		
01NF02XB0005	0.5	5.9		0.5	1.5	0.9		4.2	0.08	(0.01		
01NF02XC0007	0.3	6.4	6.5	0.5	1.5			5.8	0.15	(0.01		
01NF02XC0008	0.2	6.1	6.4	(0.50	1.5			4.9	0.15	(0.01	0.028	8.2
01NF02XC0008	0.2	6.1	6.4	(0.50	1.8			5.1	0.15	(0.01	0.040	8.6
01NF02XC0008	0.5	6.1	6.4	(0.50	1.5			5.2	0.14	(0.01	0.046	8.6
01NF02XC0009	0.2	6.1	6.5	0.5	1.5			5.1	0.14	(0.01	0.021	8.6
01NF02XC0010	0.4	6.1	6.5	0.5	1.8			5.2	0.14	(0.01	0.024	8.2

TABLE 7. Major ions and metals in five southern Labrador lakes.

STATION NO.	TOTAL ALK. (mg/l as CaCO3)	GRAN ALK. (mg/l as CaCO3)	Mn (mg/l)	Cu (mg/l)	Zn (mg/l)	Cd (mg/l)	Pb (mg/l)	Hg (ug/l)	NON-FILT RESIDUE (mg/l)	Al (mg/l)	TURBIDITY SECCHI DISC (m)	WATER DEPTH (m)
01NF02XA0005	3.0		<0.01	<0.002	<0.002	<0.001	<0.002	<0.02		0.120		1.4
01NF02XA0002	3.8		<0.01	<0.002	<0.002	<0.001	<0.002	<0.02		0.120		9.0
01NF02XA0003	2.4		<0.01	<0.002	<0.002	<0.001	<0.002	<0.02		0.120		11.0
01NF02XA0004	4.2		<0.01	<0.002	<0.002	<0.001	<0.002	<0.02		0.130		1.0
01NF02XA0003	4.1		<0.01	<0.002	<0.002	<0.001	<0.002	<0.02		0.100		1.0
01QU02WB0003	1.6			<0.002	<0.002	<0.001	<0.002	<0.02		0.070		26.5
01QU02WB0001	2.3			<0.002	0.005	<0.001	<0.002	<0.02		0.070		10.7
01QU02WB0004	1.6			<0.002	<0.002	<0.001	<0.002	<0.02		0.070		21.3
01QU02WB0002	1.6			<0.002	<0.002	<0.001	<0.002	<0.02		0.080		14.9
01QU02VC0001	2.8			<0.002	0.003	<0.001	<0.002			0.062		4.6
01QU02VC0002	2.9			<0.002	<0.002	<0.001	<0.002	<0.02		0.062		4.9
01QU02VC0003	3.0			<0.002	<0.002	<0.001	<0.002	<0.02		0.075		7.6
01QU02VC0004	2.9			<0.002	<0.002	0.001	<0.002	<0.02		0.062		3.7
01NF02XB0002		2.8		0.004	0.030	<0.001	<0.002	<0.02	<10			3.0
01NF02XB0003		2.8		0.004	0.030	<0.001	<0.002	<0.02	<10			3.1
01NF02XB0004		2.9		0.004	0.030	<0.001	<0.002	<0.02	<10			2.5
01NF02XB0005		2.8		0.004	0.040	<0.001	<0.002	<0.02	<10			3.0
01NF02XC0007	2.2			<0.002	<0.01	<0.001	0.003	<0.02	<10	0.083	0.5	0.5
01NF02XC0008	1.2			<0.002	<0.01	<0.001	<0.002	<0.02	<10			1.5
01NF02XC0008	1.2			<0.002	<0.01	<0.001	<0.002			0.100		
01NF02XC0008	1.2			<0.002	<0.01	<0.001	<0.002			0.190		
01NF02XC0009	1.2			<0.002	<0.01	<0.001	<0.002	<0.02	<10	0.093	1.0	1.3
01NF02XC0010	1.2			<0.002	<0.01	<0.001	<0.002		<10	0.110	0.8	1.5

TABLE 8. Major ion equivalent concentrations in five southern Labrador lakes.

STATION NO.	Ca++ (meq/l)	Mg++ (meq/l)	K+ (meq/l)	Na+ (meq/l)	Cl (meq/l)	SO4= (meq/l)	HCO3 (mg/l)
01NF02XA0001	0.0699	0.0313		0.0305	0.0113	0.0521	0.0599
01NF02XA0002	0.0699	0.0313		0.0305	0.0085	0.0479	0.0759
01NF02XA0003	0.0699	0.0313		0.0305	0.0113	0.0479	0.0480
01NF02XA0004	0.0699	0.0313		0.0305	0.0113	0.0479	0.0839
00NF02XA0003	0.0798	0.0345		0.0305	0.0141	0.0562	0.0819
01QU02WB0003	0.0499	0.0206	0.0026	0.0261	0.0085	0.0416	0.0320
01QU02WB0001	0.0499	0.0206	0.0102	0.0261	0.0113	0.0375	0.0460
01NF02WB0004	0.0524	0.0206	0.0026	0.0261	0.0085	0.0416	0.0320
01QU02WB0002	0.0499	0.0206	0.0051	0.0261	0.0113	0.0375	0.0320
01QU02VC0001	0.0649	0.0288	0.0026	0.0261	0.0141	0.0396	0.0559
01QU02VC0002	0.0649	0.0304	0.0153	0.0218	0.0141	0.0416	0.0579
01QU02VC0003	0.0649	0.0288	0.0102	0.0174	0.0141	0.0396	0.0599
01QU02VC0004	0.0649	0.0288	0.0077	0.0174	0.0141	0.0396	0.0579
01NF02XB0002	0.0549	0.0329	0.0051	0.0218	0.0141	0.0312	0.0559
01NF02XB0003	0.0549	0.0354	0.0051	0.0218	0.0141	0.0312	0.0559
01NF02XB0004	0.0549	0.0354	0.0026	0.0218	0.0141	0.0312	0.0579
01NF02XB0005	0.0549	0.0354	0.0026	0.0218	0.0141	0.0312	0.0559
01NF02XC0007	0.0449	0.0189	0.0026	0.0131	0.0141	0.0312	0.0440
01NF02XC0008	0.0429	0.0181	0.0026	0.0087	0.0141	0.0312	0.0240
01NF02XC0008	0.0414	0.0173	0.0026	0.0087	0.0141	0.0375	0.0240
01NF02XC0008	0.0404	0.0173	0.0051	0.0218	0.0141	0.0312	0.0240
01NF02XC0009	0.0409	0.0173	0.0026	0.0087	0.0141	0.0312	0.0240
01NF02XC0010	0.0399	0.0173	0.0026	0.0174	0.0141	0.0375	0.0240

TABLE 9. Calculated parameters for five southern Labrador lakes.

STATION NO.	SUM OF CATIONS (meq/l)	SUM OF ANIONS (meq/l)	ANIONS-CATIONS (%)	T. HARDNESS (mg/l)	SUM OF CONSTITUENTS (mg/l)
01NF02XA0001	0.1350	0.1261	3.41	5.06	10.21
01NF02XA0002	0.1332	0.1351	0.71	5.06	11.36
01NF02XA0003	0.1333	0.1095	9.81	5.06	9.72
01NF02XA0004	0.1333	0.1464	4.70	5.06	11.12
00NF02XA0003	0.1536	0.1545	0.27	5.72	12.08
01QU02WB0003	0.0992	0.0821	9.43	3.53	5.21
01QU02WB0001	0.1068	0.0948	5.95	3.53	5.83
01QU02WB0004	0.1017	0.0821	10.66	3.65	5.26
01QU02WB0002	0.1017	0.0808	11.45	3.53	5.21
01QU02VC0001	0.1228	0.1103	5.36	4.69	6.48
01QU02VC0002	0.1327	0.1143	7.46	4.77	7.06
01QU02VC0003	0.1215	0.1143	3.07	4.69	6.70
01QU02VC0004	0.1215	0.1143	3.96	4.81	6.52
01NF02XB0002	0.1159	0.1019	6.45	4.39	5.93
01NF02XB0003	0.1188	0.1019	7.65	4.52	5.96
01NF02XB0004	0.1159	0.1039	5.48	4.52	5.92
01NF02XB0005	0.1159	0.1019	6.45	4.52	5.86
01NF02XC0007	0.0799	0.0900	5.95	3.19	4.90
01NF02XC0008	0.0708	0.0763	3.75	2.94	4.40
01NF02XC0008	0.0854	0.0700	9.90	2.89	4.48
01NF02XC0008	0.0731	0.0700	2.16	3.05	4.14
01NF02XC0009	0.0703	0.0700	0.21	2.91	4.09
01NF02XC0010	0.0788	0.0763	1.09	2.86	4.57

TABLE 10. Chlorinated Hydrocarbon Pesticide and PCB residues in lake water and bottom sediments sampled from Lac Donquan in 1980.

NAQUADAT WATER	CODE SEDIMENT	PARAMETER	DETECTION LIMIT (ug/L WATER)	(mg/kg SEDIMENT)
18000L	18001L	p,p-DDT	0.001	0.001
18005L	18006L	o,p-DDT	0.001	0.001
18010L	18011L	p,p-DDD	0.001	0.001
18020L	18021L	p,p-DDE	0.001	0.001
18030L	18031L	p,p-METHOXY CHLOR	0.001	0.001
18040L	18041L	HEPTACHLOR	0.001	0.001
18045L	18046L	HEPTACHLOR EPOXIDE	0.001	0.001
18050L	18051L	ALPHA-ENDOSULFAN	0.01	0.01
18055L	18056L	BETA-ENDOSULFAN	0.010	0.01
18060L	18061L	ALPHA-CHLORDANE	0.005	0.005
18065L	18066L	GAMMA-CHLORDANE	0.005	0.005
18070L	18071L	GAMMA-BHC (LINDANE)	0.001	0.001
18075L	18076L	ALPHA-BHC	0.001	0.001
18130L	18131L	ALDRIN	0.001	0.001
18140L	18141L	ENDRIN	0.01	0.01
18150L	18151L	DIELDRIN	0.001	0.001
18164L	18169L	AROCHLORS TOTAL (PCB'S)	0.005	0.005

TABLE 10A. Chlorinated Hydrocarbon Pesticide and PCB residues in lake water and bottom sediments sampled from Lac Fonteneau, Lac Brule', St Augustin Lake and St Paul Lake.

NAQUADAT WATER	CODE SEDIMENT	PARAMETER	DETECTION LIMIT (ug/l WATER)	(mg/kg SEDIMENT)
18000L	18009L	p,p-DDT	0.001	0.001
18005L	18008L	o,p-DDT	0.001	0.001
18010L	18012L	p,p-DDD	0.001	0.001
18020L	18026L	p,p-DDE	0.001	0.001
18030L	18034L	p,p-Methoxychlor	0.001	0.001
18040L	18043L	Heptachlor	0.001	0.001
18045L	18048L	Heptachlor Epoxide	0.001	0.001
18050L	18054L	Alpha-Endosulfan	0.01	0.01
18055L	18058L	Beta-Endosulfan	0.01	0.01
18060L	18063L	Alpha-cis-Chlordane	0.005	0.005
18065L	18068L	Gamma-trans-Chlordane	0.005	0.005
18070L	18079L	Gamma-BHC (Lindane)	0.001	0.001
18075L	18074L	Alpha-BHC	0.001	0.001
18125L	18124L	Mirex	0.001	0.001
18130L	18133L	Aldrin	0.001	0.001
18140L	18143L	Endrin	0.01	0.01
18150L	18153L	Dieldrin	0.001	0.001
18164L	18177L	Total Arochlors (PCBs)	0.005	0.005

TABLE 11. Chlorinated Hydrocarbon Pesticide and PCB residues in water samples from five southern Labrador lakes.

STATION NO.	YEAR SAMPLED	p,p-DDT (ug/l)	o,p-DDT (ug/l)	p,p-DDD (ug/l)	p,p-DDE (ug/l)	p,p-METHOXY CHLOR (ug/l)	HEPTACHLOR (ug/l)	HEPTACHLOR EPOXIDE	ALPHA-ENDOSULFAN	BETA ENDOSULF
01NF02XA0001	1980	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.
01NF02XA0002	1980	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.
01NF02XA0002	1980	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.
01NF02XA0003	1980	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.
01NF02XA0003	1980	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.005	<0.
01QU02WB0003	1981	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02WB0004	1981	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0001	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0001	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0002	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0002	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0003	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0003	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0004	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01QU02VC0004	1982	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0002	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0002	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0003	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0003	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0004	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0004	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0005	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XB0005	1983	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XC0009	1984	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.
01NF02XC0010	1984	<0.001	<0.001	<0.001	<0.001	<0.01	<0.001	<0.001	<0.010	<0.

TABLE 11. Chlorinated Hydrocarbon Pesticide and PCB residues in water from five southern Labrador lakes.

NO.	ALPHA-CHLORDANE (ug/l)	GAMMA-CHLORDANE (ug/l)	GAMMA-BHC (LINDANE) (ug/l)	ALPHA-BHC (ug/l)	TOTAL MIREX (ug/l)	ALDRIN (ug/l)	ENDRIN (ug/l)	DIELDRIN (ug/l)	TOTAL AROCHLORS (PCB's) (ug/l)
01NF02XA0001	(0.005	(0.005	(0.005	(0.005		(0.005	(0.01	(0.005	(0.005
01NF02XA0002	(0.005	(0.005	(0.005	(0.005		(0.005	(0.01	(0.005	(0.005
01NF02XA0002	(0.005	(0.005	(0.005	(0.005		(0.005	(0.01	(0.005	(0.005
01NF02XA0003	(0.005	(0.005	(0.005	(0.005		(0.005	(0.01	(0.005	(0.005
01NF02XA0003	(0.005	(0.005	(0.001	(0.001		(0.001	(0.01	(0.001	(0.005
01NF02XB0003	(0.005	(0.005	(0.001	(0.001	(0.001	(0.001	(0.01	(0.001	
01NF02XB0004	(0.005	(0.005	(0.001	0.001	(0.001	(0.001	(0.01	(0.001	
01GU02VC0001	(0.005	(0.005	(0.001	0.023	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0001	(0.005	(0.005	(0.001	0.022	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0002	(0.005	(0.005	(0.001	0.022	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0002	(0.005	(0.005	(0.001	0.022	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0003	(0.005	(0.005	(0.001	0.022	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0003	(0.005	(0.005	(0.001	0.028	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0004	(0.005	(0.005	(0.001	0.015	(0.001	(0.001	(0.01	(0.001	(0.005
01GU02VC0004	(0.005	(0.005	0.002	0.025	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0002	(0.005	(0.005	(0.001	0.007	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0002	(0.005	(0.005	(0.001	0.005	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0003	(0.005	(0.005	(0.001	0.008	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0003	(0.005	(0.005	(0.001	0.004	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0004	(0.005	(0.005	(0.001	0.006	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0004	(0.005	(0.005	(0.001	0.006	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0005	(0.005	(0.005	(0.001	0.005	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XB0005	(0.005	(0.005	(0.001	0.002	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XC0009	(0.005	(0.005	(0.001	0.009	(0.001	(0.001	(0.01	(0.001	(0.005
01NF02XC0010	(0.005	(0.005	(0.001	0.008	(0.001	(0.001	(0.01	(0.001	(0.005

TABLE 12. Chlorinated Hydrocarbon Pesticide and PCB residues in bottom sediments from five Southern Labrador lakes

STATION NO	YEAR SAMPLED	p,p-DDT (mg/kg)	o,p-DDT (mg/kg)	p,p-DDD (mg/kg)	p,p-DDE (mg/kg)	p,p-METHOXYCHLOR (mg/kg)	HEPTACHLOR (mg/kg)	HEPTACHLOR EPOXIDE	ALPHA ENDOSULFAN
51NF02XA0001	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0001	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0001	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0002	1980	(0.001	(0.005	(0.005	(0.005	(0.05	(0.005	(0.005	(0.01
51NF02XA0002	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0002	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0003	1980	(0.001	(0.005	(0.005	(0.005	(0.05	(0.005	(0.005	(0.01
51NF02XA0003	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0003	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0004	1980	(0.001	(0.005	(0.005	(0.005	(0.05	(0.005	(0.005	(0.01
51NF02XA0004	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02XA0004	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
50NF02XA0003	1980	(0.001	(0.005	(0.005	(0.005	(0.05	(0.005	(0.005	(0.01
50NF02XA0003	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
50NF02XA0003	1980	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0001	1981	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02WB0001	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0001	1981	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02WB0002	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0002	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0002	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0003	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0003	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51QU02WB0003	1981	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01
51NF02WB0004	1981	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51NF02WB0004	1981	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51NF02WB0004	1981	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0001	1982	(0.001	(0.001	TRACE	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0001	1982	(0.001	(0.001	TRACE	0.0007	(0.05	(0.001	(0.001	(0.01
51QU02VC0001	1982	(0.001	(0.001	TRACE	0.0007	(0.05	(0.001	(0.001	(0.01
51QU02VC0002	1982	(0.001	(0.001	0.0008	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0002	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0002	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0003	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0003	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0003	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0004	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0004	1982	(0.001	(0.001	(0.001	TRACE	(0.05	(0.001	(0.001	(0.01
51QU02VC0004	1982	(0.001	(0.001	(0.001	(0.001	(0.05	(0.001	(0.001	(0.01

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TABLE 12 . Chlorinated Hydrocarbon Pesticide and PCB residues in bottom sediments from five Southern Labrador lakes

STATION NO	BETA ENDOSULFAN (mg/kg)	ALPHA CHLORDANE (mg/kg)	GAMMA CHLORDANE (mg/kg)	GAMMA-BHC (LINDANE) (mg/kg)	ALPHA-BHC (mg/kg)	ALDRIN (mg/kg)	ENDRIN (mg/kg)	DIELDRIN (mg/kg)	TOTAL AROCHLORS (PCB's) (mg/kg)
51NF02XA0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0002	(0.01	(0.005	(0.005	(0.005	(0.005	(0.001	(0.01	(0.005	(0.005
51NF02XA0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0003	(0.01	(0.005	(0.005	(0.005	(0.005	(0.001	(0.01	(0.005	(0.005
51NF02XA0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0004	(0.01	(0.005	(0.005	(0.005	(0.005	(0.001	(0.01	(0.005	(0.005
51NF02XA0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51NF02XA0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
50NF02XA0003	(0.01	(0.005	(0.005	(0.005	(0.005	(0.001	(0.01	(0.005	(0.005
50NF02XA0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
50NF02XA0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02WB0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.015
51QU02WB0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.013
51QU02WB0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.014
51QU02WB0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.011
51QU02WB0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	TRACE
51QU02WB0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.009
51QU02WB0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	TRACE
51QU02WB0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	TRACE
51QU02WB0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	TRACE
51QU02WB0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.009
51QU02WB0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.009
51QU02WB0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	0.007
51QU02VC0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0001	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0002	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0003	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005
51QU02VC0004	(0.01	(0.005	(0.005	(0.001	(0.001	(0.001	(0.01	(0.001	(0.005

TABLE 12 . Chlorinated Hydrocarbon Pesticide and PCB residues in bottom sediments sampled from five Southern Labrador lakes

STATION NO	YEAR SAMPLED	p,p-DDT (mg/kg)	o,p-DDT (mg/kg)	p,p-DDD (mg/kg)	p,p-DDE (mg/kg)	p,p-METHOXYCHLOR (mg/kg)	HEPTACHLOR (mg/kg)	HEPTACHLOR EPOXIDE (mg/kg)	ALPHA ENDOSULFAN (mg/kg)
51NF02XB0002	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0002	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0002	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0003	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0003	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0004	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0004	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0005	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0005	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XB0005	1983	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0007	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0007	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0007	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0008	1984	<0.001	<0.001	0.003	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0008	1984	<0.001	<0.001	0.003	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0008	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0009	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0009	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0009	1984	<0.001	<0.001	0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0010	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0010	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01
51NF02XC0010	1984	<0.001	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	<0.01

STATION NO	YEAR SAMPLED	BETA ENDOSULFAN (mg/kg)	ALPHA CHLORDANE (mg/kg)	GAMMA CHLORDANE (mg/kg)	GAMMA-BHC (LINDANE) (mg/kg)	ALPHA-BHC (mg/kg)	ALDRIN (mg/kg)	ENDRIN (mg/kg)	DIELDRIN (mg/kg)	TOTAL AROCHLORS (PCB's) (mg/kg)
51NF02XB0002	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0002	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0002	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0003	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0003	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0004	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0004	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0004	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0005	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0005	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0005	1983	<0.01	<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0007	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0007	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0007	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0008	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0008	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0008	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0009	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02ZX0009	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0009	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0010	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XC0010	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005
51NF02XB0010	1984		<0.005	<0.005	<0.001	<0.001	<0.001	<0.01		<0.005

TABLE 13. Detection limits of methods used to analyze for metals in bottom sediments from five southern Labrador lakes.

NAQUADAT CODE	PARAMETER	DETECTION LIMIT
26054L	IRON (NON-RESIDUAL)	0.5 mg/kg
29054L	COPPER (NON-RESIDUAL)	0.1 mg/kg
29051L	COPPER (TOTAL)	2.0 mg/kg
30054L	ZINC (NON-RESIDUAL)	0.1 mg/kg
30051L	ZINC (TOTAL)	2.0 mg/kg
82054L	LEAD (NON-RESIDUAL)	0.5 mg/kg
82051L	LEAD (TOTAL)	2.0 mg/kg
13054L	ALUMINUM (NON-RESIDUAL)	5.0 mg/kg
48054L	CADMIUM (NON-RESIDUAL)	0.1 mg/kg
48050L	CADMIUM (TOTAL)	10.0 mg/kg
80052L	MERCURY (TOTAL)	0.020mg/kg

TABLE 14. Metals in bottom sediments sampled from five lakes in southern Labrador

STATION NO.	YEAR SAMPLED	Cu NON-RES (mg/l)	Cu TOTAL (mg/l)	Pb NON-RES (mg/l)	Pb TOTAL (mg/l)	Zn NON-RES (mg/l)	Zn TOTAL (mg/l)	Hg TOTAL (mg/l)	Cd NON-RES (mg/l)	Cd TOTAL (mg/l)	Al NON-RES (mg/l)	T.O.C. (%)
51NF02XA0001	1980	3.2				6.1		0.050	<0.1		1110	
51NF02XA0001	1980	2.3				5.5		0.050	<0.1		970	
51NF02XA0001	1980	3.4				6.2		0.070	<0.1		1260	
51NF02XA0002	1980	8.0				15.0		0.060	<0.1		2420	
51NF02XA0002	1980	7.7				15.0		0.080	<0.1		2310	
51NF02XA0002	1980	8.2				16.0		0.030	<0.1		2510	
51NF02XA0003	1980	7.7				15.0		0.050	<0.1		2460	
51NF02XA0003	1980	7.6				14.0		0.070	<0.1		2420	
51NF02XA0003	1980	7.8				15.0		0.050	<0.1		2400	
51NF02XA0004	1980	2.2				10.0		0.030	<0.1		2020	
51NF02XA0004	1980	2.2				10.0		0.030	<0.1		1390	
51NF02XA0004	1980	1.8				8.4		0.040	<0.1		1190	
50NF02XA0003	1980	2.1				7.6		0.100	<0.1		1120	
50NF02XA0003	1980	2.0				7.2		0.160	<0.1		1100	
50NF02XA0003	1980	1.4				5.0		0.040	<0.1		760	
51NF02WB0004	1981	9.1		11.0		52.0		0.100			9130	
51NF02WB0004	1981	9.9		74.0		59.0		0.160			9670	
51NF02WB0004	1981	9.7		16.0		50.0		0.098			9330	
51QU02WB0001	1981	6.8		8.5		37.0		0.069			6530	
51QU02WB0001	1981	4.4		11.0		27.0		0.030			4200	
51QU02WB0001	1981	2.7		6.2		19.0		<0.02			1880	
51QU02WB0002	1981	3.0		7.5		39.0		<0.02			4800	
51QU02WB0002	1981	2.8		6.6		32.0		0.020			4470	
51QU02WB0002	1981	3.2		6.3		42.0		0.019			5400	
51QU02WB0003	1981	5.7		15.0		57.0		0.055			7670	
51QU02WB0003	1981	6.6		19.0		60.0		0.069			7930	
51QU02WB0003	1981	7.8		11.0		61.0		0.080			8870	
51QU02VC0001	1982	6.6		8.0		22.0		0.102			4360	
51QU02VC0001	1982	5.0		4.9		17.0					3700	
51QU02VC0001	1982	5.4		9.2		20.0		0.020			3900	
51QU02VC0002	1982	8.0		5.4		23.0		0.040			4760	
51QU02VC0002	1982	6.8		3.5		20.0		0.020			4840	
51QU02VC0002	1982	7.4		3.8		20.0		0.025			4970	
51QU02VC0003	1982	9.6		5.8		24.0		0.080			5820	
51QU02VC0003	1982	9.9		8.7		26.0		0.080			5940	
51QU02VC0003	1982	10.0		7.5		25.0		0.070			5690	
51QU02VC0004	1982	3.8		2.2		10.0					3100	
51QU02VC0004	1982	4.0		1.9		14.0		0.025			4240	
51QU02VC0004	1982	3.9		2.1		15.0					3000	
51NF02XB0002	1983		7.2		18.0		55	0.180		0.54		
51NF02XB0002	1983		6.7		2.3		55	0.090		0.20		
51NF02XB0002	1983		6.4		6.9		45	0.180		0.35		
51NF02XB0003	1983		9.9		5.8		53	0.220		0.22		
51NF02XB0003	1983		10.0		2.9		55	0.260		0.22		
51NF02XB0003	1983		9.2		7.8		52	0.080		0.31		

TABLE 14. Metals in bottom sediments sampled from five lakes in southern Labrador.

STATION NO.	YEAR SAMPLED	Cu NON-RES (mg/l)	Cu TOTAL (mg/l)	Pb NON-RES (mg/l)	Pb TOTAL (mg/l)	Zn NON-RES (mg/l)	Zn TOTAL (mg/l)	Hg TOTAL (mg/l)	Cd NON-RES (mg/l)	Cd TOTAL (mg/l)	Al NON-RES (mg/l)	T.O.C. (%)
51NF02XB0004	1983		9.7		2.7		52	0.140		0.20		
51NF02XB0004	1983		9.7		2.2		51	0.210		0.27		
51NF02XB0004	1983		9.3		2.8		51	0.110		0.27		
51NF02XB0005	1983		9.7		2.0		51	0.160		0.25		
51NF02XB0005	1983		8.5		16.0		48	0.250		0.51		
51NF02XB0005	1983		9.4		4.1		50	0.200		0.29		
51NF02XC0007	1984			5.0		14.0		(0.02			1500	3.8
51NF02XC0007	1984			5.0		13.0		(0.02			1400	2.2
51NF02XC0007	1984			4.0		13.0		(0.02			1500	4.9
51NF02XC0008	1984			12.0		40.0		0.080			5000	28.2
51NF02XC0008	1984			7.0		40.0		0.040			5000	20.8
51NF02XC0008	1984			13.0		40.0		0.070			5000	15.9
51NF02XC0009	1984			14.0		37.0		0.070			4000	29.8
51NF002XC009	1984			14.0		38.0		0.130			5000	16.3
51NF02XC0009	1984			11.0		34.0		0.050			4000	21.8
51NF02XC0010	1984			14.0		40.0		0.080			6000	26.5
51NF02XC0010	1984			15.0		40.0		0.080			6000	12.9
51NF02XC0010	1984			7.0		40.0		0.060			6000	20.9

TABLE 13. Physical measurements of fish sampled from Lac Donquan

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
NORTHERN PIKE	NP-1	1.5	720	750	F
NORTHERN PIKE	NP-2	1.5	650	675	F
NORTHERN PIKE	NP-3	3.0	785	830	F
NORTHERN PIKE	NP-4	3.2	735	780	M
NORTHERN PIKE	NP-5	1.4	480	530	F
NORTHERN PIKE	NP-6	2.7	775	815	M
LAKE WHITEFISH	LW-1	1.5	500	540	M
LAKE WHITEFISH	LW-2	1.4	440	500	M
LAKE WHITEFISH	LW-3	1.4	470	525	M
LAKE WHITEFISH	LW-4	1.4	475	520	M
LAKE WHITEFISH	LW-5	0.5	350	390	F
LAKE WHITEFISH	LW-6	1.8	490	550	F
LAKE TROUT	LT-1	5.8	775	835	F

TABLE 16. Physical measurements of fish sampled from Lac Fonteneau

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
NORTHERN PIKE	NP-1	4.5	876	914	F
NORTHERN PIKE	NP-2	1.8	641	680	M
NORTHERN PIKE	NP-3	1.0	584	610	M
NORTHERN PIKE	NP-4	1.4	622	660	F
NORTHERN PIKE	NP-5	0.9	559	591	M
NORTHERN PIKE	NP-6	1.4	597	610	M
NORTHERN PIKE	NP-7	1.1	572	597	F
NORTHERN PIKE	NP-8	2.0	686	711	M
NORTHERN PIKE	NP-9	0.9	546	572	
NORTHERN PIKE	NP-10	4.3	826	864	F
NORTHERN PIKE	NP-11	1.6	648	673	F
NORTHERN PIKE	NP-12	1.6	648	673	F
NORTHERN PIKE	NP-13	0.9	572	610	M
NORTHERN PIKE	NP-14	0.5	483	521	M
NORTHERN PIKE	NP-15	1.6	648	686	F
NORTHERN PIKE	NP-16	1.4	597	622	M
NORTHERN PIKE	NP-17	0.9	546	584	M
NORTHERN PIKE	NP-18	0.9	533	559	M
NORTHERN PIKE	NP-19	0.9	559	584	M
MUSKELLUNGE	M-1	1.4	648	686	F
MUSKELLUNGE	M-2	0.7	559	584	F
MUSKELLUNGE	M-3	1.1	610	635	F
MUSKELLUNGE	M-4	0.9	572	591	F

TABLE 17. Physical measurements of fish sampled from Lac Brule

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
LAKE TROUT	LT-1	13.00	750	830	F
LAKE TROUT	LT-10	3.75	565	615	F
LAKE TROUT	LT-11	3.50	575	630	F
LAKE TROUT	LT-12	5.00	640	700	F
LAKE TROUT	LT-13	4.20	660	690	F
LAKE TROUT	LT-14	4.50	640	695	F
LAKE TROUT	LT-15	4.00	610	660	F
LAKE TROUT	LT-2	4.00	610	665	F
LAKE TROUT	LT-3	2.80	550	595	M
LAKE TROUT	LT-4	8.50	690	765	F
LAKE TROUT	LT-5	14.00	840	885	F
LAKE TROUT	LT-6	5.00	645	690	F
LAKE TROUT	LT-7	13.00	850	900	F
LAKE TROUT	LT-8	2.00	480	510	F
LAKE TROUT	LT-9	3.00	545	590	F
NORTHERN PIKE	NP-1	3.75	590	635	M
NORTHERN PIKE	NP-2	9.00	810	860	F
NORTHERN PIKE	NP-3	11.00	930	980	F
NORTHERN PIKE	NP-4	5.75	720	770	F
NORTHERN PIKE	NP-5	3.00	595	625	M
NORTHERN PIKE	NP-6	6.00	750	790	F
NORTHERN PIKE	NP-7	7.00	810	850	F
OUANANICHE	OU-1	3.80	575	600	F
OUANANICHE	OU-10	3.60	510	555	F
OUANANICHE	OU-2	4.10	590	625	F
OUANANICHE	OU-3	4.30	600	620	F
OUANANICHE	OU-4	4.90	610	635	F
OUANANICHE	OU-5	3.75	565	610	F
OUANANICHE	OU-6	3.50	525	555	F
OUANANICHE	OU-7	4.00	530	555	F
OUANANICHE	OU-8	4.50	610	640	F
OUANANICHE	OU-9	3.40	500	535	F
LAKE WHITEFISH	WF-1	0.90	410	445	F
LAKE WHITEFISH	WF-10	3.00	480	525	F
LAKE WHITEFISH	WF-11	2.30	430	490	F
LAKE WHITEFISH	WF-12	2.50	440	490	F
LAKE WHITEFISH	WF-13	2.00	420	470	F
LAKE WHITEFISH	WF-14	2.30	420	470	F
LAKE WHITEFISH	WF-15	2.30	440	490	F
LAKE WHITEFISH	WF-2	2.50	460	510	M
LAKE WHITEFISH	WF-3	0.30	310	340	M
LAKE WHITEFISH	WF-4	3.50	490	530	F
LAKE WHITEFISH	WF-5	2.30	465	520	F
LAKE WHITEFISH	WF-6	2.50	450	500	F
LAKE WHITEFISH	WF-7	2.60	480	530	M
LAKE WHITEFISH	WF-8	2.00	420	470	M
LAKE WHITEFISH	WF-9	2.30	460	510	F
WHITE SUCKER	WS-1	4.00	530	560	F
WHITE SUCKER	WS-10	1.50	370	400	M
WHITE SUCKER	WS-11	1.00	345	365	M
WHITE SUCKER	WS-12	1.10	345	365	M

TABLE 17. Physical measurements of fish sampled from Lac Brule.

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
WHITE SUCKER	WS-2	2.50	480	520	F
WHITE SUCKER	WS-3	3.50	510	545	F
WHITE SUCKER	WS-4	2.60	480	520	F
WHITE SUCKER	WS-5	2.40	440	465	M
WHITE SUCKER	WS-6	1.60	385	415	M
WHITE SUCKER	WS-7	2.10	420	445	M
WHITE SUCKER	WS-8	1.30	350	370	M
WHITE SUCKER	WS-9	3.90	535	555	F

TABLE 18. Physical measurements of fish sampled from St Augustin Lake.

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TOTAL LENGTH (MM)	SEX	ESTIMATED AGE (MEDIAN-YRS)
NORTHERN PIKE	NP-1	7.50	819	864	F	8
NORTHERN PIKE	NP-2	6.50	743	787	M	9
NORTHERN PIKE	NP-3	6.50	762	813	M	8
NORTHERN PIKE	NP-4	5.75	673	749	M	11
NORTHERN PIKE	NP-5	5.50	768	800	F	8
NORTHERN PIKE	NP-6	13.00	940	1016	F	13
NORTHERN PIKE	NP-7	6.75	762	800	F	9
NORTHERN PIKE	NP-8	12.75	902	965	F	8
NORTHERN PIKE	NP-9	7.50	749	826	F	7
NORTHERN PIKE	NP-10	6.25	724	762	M	8
NORTHERN PIKE	NP-11	5.25	699	762	M	6
NORTHERN PIKE	NP-12	5.50	699	749	M	7
NORTHERN PIKE	NP-13	5.75	699	762	M	8
EASTERN BK. TROUT	ST-1	0.45	210	229	M	
EASTERN BK. TROUT	ST-2	0.45	210	229	M	
EASTERN BK. TROUT	ST-3	0.50	229	235	F	
EASTERN BK. TROUT	ST-4	0.45	216	229	F	
EASTERN BK. TROUT	ST-5	0.50	254	267	F	
EASTERN BK. TROUT	ST-6	0.50	241	254	F	
WHITE SUCKER	WS-1	2.75	406	457	F	6
WHITE SUCKER	WS-2	1.75	330	381	F	7
WHITE SUCKER	WS-3	0.50	203	229	M	5
WHITE SUCKER	WS-4	0.50	216	235	M	6
WHITE SUCKER	WS-6	1.00	305	318	M	10
WHITE SUCKER	WS-5	1.50	324	356	M	8
WHITE SUCKER	WS-8	1.10	286	311	F	6
WHITE SUCKER	WS-9	1.25	292	343	F	
WHITE SUCKER	WS-10	1.50	318	362	M	
WHITE SUCKER	WS-11	0.50	222	254	M	
WHITE SUCKER	WS-12	1.25	318	349	M	
WHITE SUCKER	WS-13	1.25	330	343	F	
WHITE SUCKER	WS-14	2.75	406	457	F	
WHITE SUCKER	WS-15	1.50	330	368	M	
WHITE SUCKER	WS-16	1.00	267	305	F	

TABLE 19. Physical measurements of fish sampled from St Paul Lake.

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
E.BROOK TROUT	ST-1	1.20	350	363	
E.BROOK TROUT	ST-1	1.20	363	375	
E.BROOK TROUT	ST-1	1.20	350	363	
E.BROOK TROUT	ST-2	0.80	285	305	
E.BROOK TROUT	ST-2	0.80	273	285	
E.BROOK TROUT	ST-2	0.80	248	260	
E.BROOK TROUT	ST-3	1.60	363	388	F
E.BROOK TROUT	ST-4	1.00	305	325	F
E.BROOK TROUT	ST-5	1.00	325	338	M
E.BROOK TROUT	ST-6	1.20	338	350	M
E.BROOK TROUT	ST-6	1.20	350	363	M
E.BROOK TROUT	ST-7	1.30	350	363	F
E.BROOK TROUT	ST-7	1.25	350	363	F
E.BROOK TROUT	ST-8	1.50	363	375	F
E.BROOK TROUT	ST-8	1.50	375	388	F
E.BROOK TROUT	ST-9	1.50	375	388	M
E.BROOK TROUT	ST-9	1.50	375	388	M
E.BROOK TROUT	ST-9	1.50	375	388	M
E.BROOK TROUT	ST-10	1.75	400	415	M
E.BROOK TROUT	ST-11	1.70	415	400	F
E.BROOK TROUT	ST-12	1.80	400	415	F
E.BROOK TROUT	ST-13	1.80	400	430	M
WHITE SUCKER	WS-1	1.50	350	363	M
WHITE SUCKER	WS-1	1.50	350	375	
WHITE SUCKER	WS-1	1.40	363	388	M
WHITE SUCKER	WS-1	1.50	350	375	
WHITE SUCKER	WS-2	2.40	440	450	F
WHITE SUCKER	WS-3	1.70	388	400	F
WHITE SUCKER	WS-4	1.75	400	415	M
WHITE SUCKER	WS-4	1.50	375	388	M
WHITE SUCKER	WS-4	1.60	375	388	M
WHITE SUCKER	WS-4	1.55	375	400	M

TABLE 19. Physical measurements of fish sampled from St paul Lake.

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
WHITE SUCKER	WS-5	1.80	400	430	M
WHITE SUCKER	WS-5	1.60	388	415	M
WHITE SUCKER	WS-5	1.80	388	415	M
WHITE SUCKER	WS-5	1.70	400	430	M
WHITE SUCKER	WS-6	1.75	415	430	M
WHITE SUCKER	WS-6	1.80	400	415	M
WHITE SUCKER	WS-6	1.80	400	430	M
WHITE SUCKER	WS-7	1.75	400	415	F
WHITE SUCKER	WS-7	2.00	430	440	F
WHITE SUCKER	WS-7	1.70	415	430	F
WHITE SUCKER	WS-7	1.80	415	430	F
WHITE SUCKER	WS-8	1.85	430	440	F
WHITE SUCKER	WS-8	1.80	400	415	F
WHITE SUCKER	WS-8	1.75	415	430	F
WHITE SUCKER	WS-9	1.80	430	440	F
WHITE SUCKER	WS-9	1.90	430	440	F
WHITE SUCKER	WS-9	1.80	415	430	F
WHITE SUCKER	WS-9	1.80	400	415	F
WHITE SUCKER	WS-10	1.40	325	338	M
WHITE SUCKER	WS-10	1.50	350	363	M
WHITE SUCKER	WS-10	1.50	363	375	M
WHITE SUCKER	WS-11	1.70	388	400	M
WHITE SUCKER	WS-11	1.20	363	375	M
WHITE SUCKER	WS-11	1.70	400	415	M
WHITE SUCKER	WS-12	1.80	415	430	M
WHITE SUCKER	WS-12	1.90	400	415	M
WHITE SUCKER	WS-12	1.90	415	440	M
WHITE SUCKER	WS-13	1.80	430	440	F
WHITE SUCKER	WS-13	1.70	400	415	F
WHITE SUCKER	WS-13		415	430	F
WHITE SUCKER	WS-14	1.70	388	400	F
WHITE SUCKER	WS-14	1.80	415	430	F
WHITE SUCKER	WS-15	2.00	415	430	F
WHITE SUCKER	WS-15	2.00	430	440	F
WHITE SUCKER	WS-15	2.00	430	440	F
WHITE SUCKER	WS-16	1.90	415	430	F
WHITE SUCKER	WS-16	1.80	400	430	F
WHITE SUCKER	WS-16	2.10	450	458	F

TABLE 19. Physical measurements of fish sampled from St Paul Lake.

SPECIES	SAMPLE NO.	WEIGHT (KG)	FORK LENGTH (MM)	TAIL LENGTH (MM)	SEX
LONGNOSE SUCKER	LS-10	1.70	400	415	M
LONGNOSE SUCKER	LS-10	1.75	415	430	M
LONGNOSE SUCKER	LS-10	1.70	400	415	M
LONGNOSE SUCKER	LS-11	1.50	375	388	M
LONGNOSE SUCKER	LS-11	1.60	400	415	M
LONGNOSE SUCKER	LS-11	1.60	375	400	M
LONGNOSE SUCKER	LS-12	1.50	375	388	M
LONGNOSE SUCKER	LS-12	1.60	400	415	M
LONGNOSE SUCKER	LS-12	1.50	375	388	M
LONGNOSE SUCKER	LS-12	1.50	388	415	M
LONGNOSE SUCKER	LS-13	0.80	250	260	
LONGNOSE SUCKER	LS-13	0.80	235	248	
LONGNOSE SUCKER	LS-13	0.80	248	260	
LONGNOSE SUCKER	LS-14	1.00	285	305	M
LONGNOSE SUCKER	LS-15	2.30	450	465	M
LONGNOSE SUCKER	LS-16	2.30	450	465	F
LONGNOSE SUCKER	LS-17	2.00	430	450	F
LONGNOSE SUCKER	LS-18	0.80	305	325	M
LONGNOSE SUCKER	LS-18	0.90	305	325	M
LONGNOSE SUCKER	LS-19	1.10	338	350	F
LONGNOSE SUCKER	LS-19	1.20	363	375	M
LONGNOSE SUCKER	LS-19	1.20	363	375	M
LONGNOSE SUCKER	LS-20	1.60	400	415	M
LONGNOSE SUCKER	LS-20	1.50	388	400	M
LONGNOSE SUCKER	LS-20	1.30	375	388	M
LONGNOSE SUCKER	LS-20	1.30	400	415	M
LONGNOSE SUCKER	LS-21	1.40	400	415	F
LONGNOSE SUCKER	LS-21	1.60	400	415	F
LONGNOSE SUCKER	LS-21	1.60	415	430	F
LONGNOSE SUCKER	LS-21	1.50	415	430	F
LONGNOSE SUCKER	LS-22	2.10	458	475	F
LONGNOSE SUCKER	LS-23	2.00	430	450	M

TABLE 20. Detection limits of methods used to analyze fish tissue samples for metals

NAQUADAT CODE	PARAMETER	DETECTION LIMIT
29601L	COPPER (TOTAL)	0.200 mg/kg
30601L	ZINC (TOTAL)	0.200 mg/kg
24601L	CHROMIUM (TOTAL)	0.200 mg/kg
82601L	LEAD (TOTAL)	0.050 mg/kg
48601L	CADMIUM (TOTAL)	0.025 mg/kg
28601L	NICKEL (TOTAL)	0.050 mg/kg
13601L	ALUMINUM (TOTAL)	2.0 mg/kg
80602L	MERCURY (TOTAL)	0.020 mg/kg

TABLE 21. Metals in fish tissue from five southern Labrador lakes.

LOCATION	FISH SPECIES	TISSUE TYPE	YEAR SAMPLED	Hg (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Al (mg/kg)	Ni (mg/kg)	Cr (mg/kg)
FONTENEAU	NP-11	GONADS	1981	0.250	0.048	1.50	0.08				
FONTENEAU	NP-17	GONADS	1981	0.040		(0.20					
FONTENEAU	M-2	GONADS	1981	0.150	(0.025	0.90	(0.05				
FONTENEAU	M-4	GONADS	1981	0.050		1.10					
FONTENEAU	MS-2	GONADS	1981	(0.02	(0.025	1.30	(0.05		(2.0		
BRULE	LT-10	GONADS	1982	0.430	0.070	4.10	(0.05		(2.0	(0.05	(0.2
BRULE	LT-12	GONADS	1982	2.850	0.050	0.58	0.06	21.0	(2.0	(0.05	(0.2
BRULE	LT-2	GONADS	1982	1.580	(0.025	3.00	(0.05		5.7	(0.05	(0.2
BRULE	LT-4	GONADS	1982	0.430	0.090	5.60	0.12		9.6	(0.05	0.3
BRULE	NP-4	GONADS	1982	0.025	(0.025	1.20	(0.05		(2.0	(0.05	(0.2
BRULE	NP-5	GONADS	1982	0.380	0.050	0.25	(0.05	13.0	(2.0		
BRULE	NP-7	GONADS	1982	0.180	(0.025	1.00	(0.05		(2.0	(0.05	(0.2
BRULE	OU-1	GONADS	1982	0.098	0.050	23.00	(0.05	122.0	(2.0	(0.05	(0.2
BRULE	OU-2	GONADS	1982	0.460	(0.025	4.20	(0.05		2.8	(0.05	(0.2
BRULE	OU-6	GONADS	1982	0.060	(0.025	22.00	(0.05		(2.0	(0.05	(0.2
BRULE	OU-7	GONADS	1982	0.150	(0.025	26.00	(0.05		(2.0	(0.05	(0.2
BRULE	WF-1	GONADS	1982	0.077	(0.025	0.70	(0.05	50.0	(2.0	0.12	(0.2
BRULE	WF-11	GONADS	1982	0.063	(0.025	0.71	(0.05		(2.0	(0.05	(0.2
BRULE	WF-15	GONADS	1982	0.130	0.060	0.87	(0.05		3.7	(0.05	(0.2
BRULE	WF-4	GONADS	1982	0.180	0.030	0.70	0.14		16.0	0.17	0.3
BRULE	WF-5	GONADS	1982	0.145	0.030	0.57	(0.05	135.0	4.7	(0.05	(0.2
BRULE	WF-7	GONADS	1982	0.313	(0.025	0.25	(0.05	17.0	4.0	0.07	(0.2
BRULE	WF-9	GONADS	1982	0.106	(0.025	0.94	(0.05		(2.0	(0.05	(0.2
BRULE	WS-2	GONADS	1982	0.080	(0.025	0.59	(0.05	9.9	2.8	(0.05	(0.2
BRULE	WS-4	GONADS	1982	0.280	(0.025	1.10	(0.05	27.0	36.0	(0.05	(0.2
BRULE	NP-4	HEART	1982	0.620	(0.025	2.60	(0.05		(2.0	(0.05	(0.2
BRULE	NP-7	HEART	1982		(0.025	2.00	(0.05	72.0	(2.0	(0.05	(0.2
BRULE	OU-7	HEART	1982		0.250	2.40	(0.05	72.0	(2.0	(0.05	(0.2
BRULE	LT-10	LIVER	1982	1.330	0.360	22.00	0.06	60.0	4.1	(0.05	(0.2
BRULE	LT-12	LIVER	1982	10.200	0.100	1.30	(0.05		4.0	(0.05	(0.2
BRULE	LT-2	LIVER	1982	2.550	0.360	30.00	(0.05		6.8	(0.05	(0.2
BRULE	LT-4	LIVER	1982	1.100	0.070	20.00	(0.05		5.0	(0.05	(0.2
BRULE	LT-9	LIVER	1982	2.550	0.160	43.00	(0.05		3.1	(0.05	(0.2
BRULE	NP-4	LIVER	1982	0.210	0.070	14.00	(0.05		(2.0	(0.05	(0.2
BRULE	NP-5	LIVER	1982	0.400	0.150	10.00	0.06	123.0	2.6	(0.05	0.2
BRULE	NP-7	LIVER	1982	0.620	0.040	10.00	(0.05	38.0	(2.0	(0.05	(0.2
BRULE	OU-1	LIVER	1982	0.470	0.040	54.00	(0.05	48.0	(2.0	(0.05	(0.2
BRULE	OU-2	LIVER	1982	1.130	0.050	11.00	(0.05		2.8	0.16	(0.2
BRULE	OU-4	LIVER	1982	0.500	0.040	60.00	(0.05		2.7	(0.05	(0.2
BRULE	OU-6	LIVER	1982	0.600	0.040	40.00	(0.05		(2.0	0.06	(0.2
BRULE	OU-7	LIVER	1982	0.500	0.090	31.00	(0.05	39.0	(2.0	(0.05	(0.2
BRULE	OU-9	LIVER	1982	0.650	0.050	29.00	(0.05	36.0	(2.0	(0.05	(0.2
BRULE	WF-1	LIVER	1982	0.680	0.190	5.10	(0.05	31.0	4.8	(0.05	(0.2
BRULE	WF-11	LIVER	1982	0.390	0.120	5.70	(0.05	28.0	2.1	(0.05	(0.2
BRULE	WF-13	LIVER	1982	0.287	0.150	4.80	(0.05		5.5	(0.05	(0.2
BRULE	WF-15	LIVER	1982	0.186	0.180	8.00	0.11	42.0	7.1	(0.05	(0.2
BRULE	WF-3	LIVER	1982		0.450	4.30	(0.05	75.0	(2.0	(0.05	(0.2
BRULE	WF-4	LIVER	1982	0.600	0.970	9.80	0.10		23.0	(0.05	(0.2
BRULE	WF-7	LIVER	1982	0.720	0.630	4.30	(0.05	45.0	33.0	0.08	(0.2

TABLE 21. Metals in fish tissue from five southern Labrador lakes.

LOCATION	FISH SPECIES	TISSUE TYPE	YEAR SAMPLED	Hg (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Al (mg/kg)	Ni (mg/kg)	Cr (mg/kg)
BRULE	WS-4	LIVER	1982		0.220	23.7	(0.05	28.0	2.8	(0.05	(0.2
BRULE	WS-2	LIVER	1982		1.4	14.0	(0.05	57.0	30.0	(0.05	(0.2
BRULE	WF-8	LIVER	1982	1.7	0.590	15.0	(0.05	50.0	13.0	0.07	(0.2
BRULE	WF-9	LIVER	1982	0.260	0.500	2.80	0.06	40.0	550.0	0.63	2.4
BRULE	WS-10	LIVER	1982	0.090	0.350	9.90					
BRULE	WS-6	LIVER	1982	0.035	0.330	6.40	0.16	29.0	1000.0	0.72	4.1
BRULE	WS-8	LIVER	1982	0.090	0.120	6.00	0.08	27.0	1320.0	1.10	5.1
BRULE	LT-10	MUSCLE	1982	0.620	(0.025	0.47	0.06	10.0	(2.0	(0.05	(0.2
BRULE	LT-2	MUSCLE	1982	1.880	(0.025	0.51	(0.05	14.0	(2.0	(0.05	(0.2
BRULE	LT-4	MUSCLE	1982	0.966	(0.025	0.48	(0.05	5.0	(2.0	(0.05	(0.2
BRULE	NP-4	MUSCLE	1982	0.490	(0.025	(0.20	(0.05		(2.0	(0.05	(0.2
BRULE	NP-5	MUSCLE	1982	0.500	(0.025	0.41	(0.05	12.0	(2.0	(0.05	(0.2
BRULE	NP-7	MUSCLE	1982	0.390	(0.025	0.26	(0.05	7.2	(2.0	(0.05	(0.2
BRULE	OU-1	MUSCLE	1982	0.189	(0.025	0.50	(0.05	6.2	(2.0	0.07	(0.2
BRULE	OU-2	MUSCLE	1982	0.770	(0.025	0.51	0.07		2.3	(0.05	(0.2
BRULE	OU-9	MUSCLE	1982	0.310	(0.025	0.61	(0.05		(2.0	(0.05	0.2
BRULE	WF-1	MUSCLE	1982	0.700	0.070	(0.20	(0.05	4.5	2.1	(0.05	(0.2
BRULE	WF-11	MUSCLE	1982	0.195	(0.025	0.37	(0.05		(2.0	(0.05	0.2
BRULE	WF-13	MUSCLE	1982	0.067	(0.025	(0.20	(0.05	13.0	2.0	(0.05	0.2
BRULE	WF-18	MUSCLE	1982	0.168	(0.025	0.23	(0.05		(2.0	(0.05	0.2
BRULE	WF-3	MUSCLE	1982	0.085	(0.025	(0.20	(0.05		2.2	(0.05	(0.2
BRULE	WF-4	MUSCLE	1982	0.150	(0.025	(0.20	(0.05		3.3	(0.05	(0.2
BRULE	WF-5	MUSCLE	1982	0.460	(0.025	0.47	0.07	14.0	(2.0	(0.05	(0.2
BRULE	WF-7	MUSCLE	1982	0.257	(0.025	(0.20	0.05	14.0	(2.0	(0.05	0.2
BRULE	WF-9	MUSCLE	1982	0.069	(0.025	(0.20	(0.05	5.6	(2.0	(0.05	(0.2
BRULE	WS-10	MUSCLE	1982	0.075	(0.025	(0.20	(0.05	8.6	4.8	(0.05	0.2
BRULE	WS-12	MUSCLE	1982	0.202	(0.025	0.25	(0.05	6.3	(2.0	0.07	0.2
BRULE	WS-2	MUSCLE	1982	0.480	(0.025	0.57	(0.05	43.0	8.8	(0.05	(0.2
BRULE	WS-4	MUSCLE	1982	0.285	(0.025	0.40	(0.05	15.0	3.4	(0.05	(0.2
BRULE	WS-6	MUSCLE	1982	0.056	(0.025	0.35	(0.05	6.3	(2.0	(0.05	(0.2
BRULE	WS-8	MUSCLE	1982	0.080	(0.025	(0.20	0.05	6.9	(2.0	(0.05	0.2
ST AUGUSTIN	NP-10	GONADS	1983	0.230	0.080	0.33	0.05	12.0	(2.0		
ST AUGUSTIN	NP-12	GONADS	1983	0.216	0.130	0.37	0.06	13.0	2.5		
ST AUGUSTIN	NP-2	GONADS	1983	1.970	0.110	0.34	0.35	11.0	(2.0		
ST AUGUSTIN	NP-4	GONADS	1983	0.397	0.070	0.36	0.06	14.0	(2.0		
ST AUGUSTIN	NP-5	GONADS	1983	1.190	(0.025	1.30	(0.05	79.0	(2.0		
ST AUGUSTIN	NP-7	GONADS	1983	0.390	0.040	1.30	(0.05	80.0	(2.0		
ST AUGUSTIN	WS-1	GONADS	1983	0.861	(0.025	1.50	0.06	29.0	3.0		
ST AUGUSTIN	WS-14	GONADS	1983	0.519	0.040	1.60	(0.05	27.0	(2.0		
ST AUGUSTIN	NP-10	LIVER	1983	0.230	0.040	9.00	(0.05	35.0	(2.0		
ST AUGUSTIN	NP-12	LIVER	1983	1.360	0.160	38.0	(0.05	42.0	(2.0		
ST AUGUSTIN	NP-2	LIVER	1983	0.544	0.140	23.0	(0.05	39.0	2.4		
ST AUGUSTIN	NP-4	LIVER	1983	0.197	0.040	12.0	(0.05	30.0	(2.0		
ST AUGUSTIN	NP-5	LIVER	1983	0.649	0.070	34.0	(0.05	46.0	(2.0		
ST AUGUSTIN	NP-7	LIVER	1983	0.238	0.050	16.0	(0.05	37.0	(2.0		
ST AUGUSTIN	WS-1	LIVER	1983	0.580	0.160	2.50	0.13	21.0	7.2		
ST AUGUSTIN	WS-14	LIVER	1983	0.234	0.160	6.40	(0.05	29.0	2.4		
ST AUGUSTIN	NP-10	MUSCLE	1983	0.500	(0.025	0.26	(0.05	6.1	(2.0		
ST AUGUSTIN	NP-12	MUSCLE	1983	0.483	(0.025	0.24	(0.05	6.3	(2.0		
ST AUGUSTIN	NP-2	MUSCLE	1983	0.386	(0.025	0.28	(0.05	5.9	(2.0		
ST AUGUSTIN	NP-4	MUSCLE	1983	0.552	(0.025	0.27	(0.05	6.1	(2.0		
ST AUGUSTIN	NP-5	MUSCLE	1983	0.299	(0.025	0.25	(0.05	6.4	(2.0		

TABLE 21. Metals in fish tissue from five southern Labrador lakes.

LOCATION	FISH SPECIES	TISSUE TYPE	YEAR SAMPLED	Hg (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Al (mg/kg)	Ni (mg/kg)	Cr (mg/kg)
ST AUGUSTIN	NP-7	MUSCLE	1983	0.333	<0.025	0.16	<0.05	5.4	<2.0		
ST AUGUSTIN	ST-2	MUSCLE	1983	0.378	0.040	0.39	0.10	16.0	<2.0		
ST AUGUSTIN	ST-3	MUSCLE	1983	0.200	<0.025	0.41	<0.05	8.1	<2.0		
ST AUGUSTIN	ST-4	MUSCLE	1983	1.930	<0.025	0.54	<0.05	8.6	<2.0		
ST AUGUSTIN	ST-6	MUSCLE	1983	0.185	<0.025	0.44	<0.05	9.0	<2.0		
ST AUGUSTIN	WS-1	MUSCLE	1983	0.108	<0.025	0.48	0.06	5.8	<2.0		
ST AUGUSTIN	WS-10	MUSCLE	1983	0.195	0.040	0.50	<0.05	6.5	2.1		
ST AUGUSTIN	WS-11	MUSCLE	1983	0.357	0.030	0.37	<0.05	6.2	<2.0		
ST AUGUSTIN	WS-14	MUSCLE	1983	0.363	<0.025	0.28	<0.05	5.5	<2.0		
ST AUGUSTIN	WS-16	MUSCLE	1983	0.103	<0.025	0.45	<0.05	4.5	<2.0		
ST AUGUSTIN	WS-4	MUSCLE	1983	1.730	<0.025	0.39	<0.05	6.2	<2.0		
ST AUGUSTIN	WS-8	MUSCLE	1983	0.527	0.030	0.38	0.08	4.5	<2.0		
ST AUGUSTIN	WLR	PLANT	1983		0.150	1.20	0.12	6.3			
ST AUGUSTIN	MYR-1	PLANT	1983		0.025	0.70	0.16	5.9			
ST AUGUSTIN	VAL	PLANT	1983		0.040	0.14	0.06	6.7			
ST PAUL	LS-10	MUSCLE	1984	0.400	0.029	<0.20	<0.05	10.0	7.0	0.05	
ST PAUL	LS-11	MUSCLE	1984	0.150	<0.025	0.38	<0.05	9.3	<1.0	0.13	
ST PAUL	LS-12	MUSCLE	1984	0.160	0.029	<0.20	<0.05	4.4	2.2	0.10	
ST PAUL	LS-13	MUSCLE	1984	0.030	<0.025	0.47	0.065	5.9	<1.0	0.09	
ST PAUL	LS-14	MUSCLE	1984	0.060	0.040	<0.20	<0.05	6.8	<2.0	<0.05	
ST PAUL	LS-15	MUSCLE	1984	0.350	<0.025	0.28	<0.05	4.4	2.0	<0.05	
ST PAUL	LS-16	MUSCLE	1984	0.380	<0.025	<0.20	<0.05	7.7	3.8	0.17	
ST PAUL	LS-17	MUSCLE	1984	0.270	0.029	0.29	<0.05	8.1	2.3	0.22	
ST PAUL	LS-18	MUSCLE	1984	0.060	<0.025	0.44	<0.05	6.9	<1.0	0.10	
ST PAUL	LS-19	MUSCLE	1984	0.110	<0.025	0.41	<0.05	12.0	<1.0	0.12	
ST PAUL	LS-20	MUSCLE	1984	0.230	<0.025	0.35	<0.05	8.0	<2.0	0.10	
ST PAUL	LS-21	MUSCLE	1984	0.450	0.060	0.38	0.06	9.4	2.7	0.66	
ST PAUL	LS-22	MUSCLE	1984	0.330	0.020	0.52	0.05	14.0	5.0	0.05	
ST PAUL	LS-23	MUSCLE	1984	0.080	<0.025	0.33	0.05	3.4	3.0	0.05	
ST PAUL	NP-1	MUSCLE	1984	0.150	<0.025	0.37	0.10	11.0	5.5	0.05	
ST PAUL	ST-1	MUSCLE	1984	0.040	<0.025	0.37	0.06	5.5	3.0	<0.05	
ST PAUL	ST-10	MUSCLE	1984	0.020	<0.025	0.39	0.10	5.0	2.3	<0.05	
ST PAUL	ST-11	MUSCLE	1984	0.050	<0.025	0.26	0.07	5.0	3.4	<0.05	
ST PAUL	ST-12	MUSCLE	1984	0.100	<0.025	0.36	0.09	6.5	3.0	<0.05	
ST PAUL	ST-13	MUSCLE	1984	0.080	<0.025	0.55	0.34	5.5	3.0	<0.05	
ST PAUL	ST-2	MUSCLE	1984	0.040	<0.025	0.20	<0.05	5.0	4.0	<0.05	
ST PAUL	ST-3	MUSCLE	1984	0.080	<0.025	0.46	<0.05	6.0	15.0	<0.05	
ST PAUL	ST-4	MUSCLE	1984	0.030	<0.025	0.21	<0.05	6.0	2.8	<0.05	
ST PAUL	ST-5	MUSCLE	1984	0.020	0.025	0.83	0.05	57.0	22.0	0.23	
ST PAUL	ST-6	MUSCLE	1984	0.050	<0.025	0.20	<0.05	4.8	1.8	<0.05	
ST PAUL	ST-7	MUSCLE	1984	0.050	<0.025	0.44	0.07	12.0	1.5	<0.05	
ST PAUL	ST-8	MUSCLE	1984	0.040		<0.20	<0.05	5.2	2.8	0.06	
ST PAUL	ST-9	MUSCLE	1984	0.070	<0.025	0.37	0.13	6.0	1.7	<0.05	
ST PAUL	WS-1	MUSCLE	1984	0.240	<0.025	0.34	0.05	7.0	2.4	0.08	
ST PAUL	WS-10	MUSCLE	1984	0.050	<0.025	0.48	0.07	4.0	7.0	0.05	
ST PAUL	WS-11	MUSCLE	1984	0.230	<0.025	0.61	0.06	7.3	6.0	<0.05	
ST PAUL	WS-12	MUSCLE	1984	0.160	0.030	0.62	0.07	8.7	15.0	0.05	

TABLE 21. Metals in fish tissue from five southern Labrador lakes.

LOCATION	FISH SPECIES	TISSUE TYPE	YEAR SAMPLED	Hg (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Zn (mg/kg)	Al (mg/kg)	Ni (mg/kg)	Cr (mg/kg)
ST PAUL	WS-13	MUSCLE	1984	0.190	(0.025	0.37	0.09	6.4	10.0	0.05	
ST PAUL	WS-14	MUSCLE	1984	0.190	0.030	0.40	0.07	9.0	12.0	0.09	
ST PAUL	WS-15	MUSCLE	1984	0.260	(0.025	0.28	0.10	5.3	16.0	0.07	
ST PAUL	WS-16	MUSCLE	1984	0.260	(0.025	0.30	0.16	6.0	4.0	0.05	
ST PAUL	WS-2	MUSCLE	1984	0.100	(0.025	0.31	0.05	6.6	1.7	0.07	
ST PAUL	WS-3	MUSCLE	1984	0.130	(0.025	0.28	0.06	4.8	(1.0	0.05	
ST PAUL	WS-4	MUSCLE	1984	0.160	(0.025	0.71	0.07	13.0	4.0	0.09	
ST PAUL	WS-5	MUSCLE	1984	0.260	(0.025	0.65	0.06	5.8	8.0	0.05	
ST PAUL	WS-6	MUSCLE	1984	0.220	(0.025	0.37	(0.05	5.4	3.5	0.08	
ST PAUL	WS-7	MUSCLE	1984	0.210	(0.025	0.32	0.07	5.3	6.0	0.05	
ST PAUL	WS-8	MUSCLE	1984	0.330	(0.025	0.51	0.06	8.0	5.0	0.05	
ST PAUL	WS-9	MUSCLE	1984	0.330	(0.025	0.62	0.07	7.0	3.0	0.07	

TABLE 22. Detection limits of methods used to analyze fish tissue samples from five southern Labrador lakes for detectable Chlorinated Hydrocarbon Pesticide and PCB residues

NAQUADAT CODE	PARAMETER	DETECTION LIMIT
18602L	p,p'-DDT	0.001 mg/kg
18606L	o,p'-DDT	0.001 mg/kg
18611L	p,p -DDD	0.001 mg/kg
18621L	p,p'-DDE	0.001 mg/kg
18676L	ALPHA BHC	0.001 mg/kg
18669L	AROCHLOR TOTAL (PCB's)	0.005 mg/kg

TABLE 23. Chlorinated Hydrocarbon Pesticide and PCB residues in fish tissue from five southern Labrador lakes.

LAKE	SAMPLE NO.	TISSUE TYPE	YEAR SAMPLED	o,p'-DDT (mg/kg)	p,p'-DDD (mg/kg)	p,p-DDE (mg/kg)	T-DDT (mg/kg)	GAMMA-BHC (mg/kg)	ALPHA-BHC (mg/kg)	TOTAL AROCHLORS (PCB's)
DONQUAN	LT-1	GONADS	1980	(0.001	(0.001	0.130	0.130	(0.001	(0.001	0.110
DONQUAN	NP-2	GONADS	1980	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
DONQUAN	NP-3	GONADS	1980	(0.001	(0.001	0.004	0.004	(0.001	(0.001	(0.005
DONQUAN	WF-2	GONADS	1980	(0.001	(0.001	0.016	0.016	(0.001	(0.001	(0.005
DONQUAN	WF-6	GONADS	1980	(0.001	(0.001	0.006	0.006	(0.001	(0.001	(0.005
DONQUAN	BB-1	LIVER	1980	(0.001	(0.001	0.140	0.140	(0.001	(0.001	0.410
DONQUAN	LT-1	LIVER	1980	(0.001	(0.001	0.100	0.100	(0.001	(0.001	0.140
DONQUAN	NP-1	LIVER	1980	(0.001	(0.001	0.004	0.004	(0.001	(0.001	2.200
DONQUAN	NP-3	LIVER	1980	(0.001	(0.001	0.017	0.017	(0.001	(0.001	0.010
DONQUAN	NP-4	LIVER	1980	(0.001	(0.001	0.017	0.017	(0.001	(0.001	0.010
DONQUAN	NP-5	LIVER	1980	(0.001	(0.001	0.023	0.023	(0.001	(0.001	(0.005
DONQUAN	NP-6	LIVER	1980	(0.001	(0.001	0.120	0.120	(0.001	(0.001	0.250
DONQUAN	WF-1	LIVER	1980	(0.001	(0.001	0.010	0.010	(0.001	(0.001	(0.005
DONQUAN	WF-3	LIVER	1980	(0.001	(0.001	0.003	0.003	(0.001	(0.001	(0.005
DONQUAN	WF-6	LIVER	1980	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
DONQUAN	LT-1	MUSCLE	1980	(0.001	(0.001	0.120	0.120	(0.001	(0.001	0.068
DONQUAN	NP-1	MUSCLE	1980	(0.001	(0.001	0.016	0.016	(0.001	(0.001	0.027
DONQUAN	NP-2	MUSCLE	1980	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
DONQUAN	NP-3	MUSCLE	1980	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
DONQUAN	NP-4	MUSCLE	1980	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
DONQUAN	NP-5	MUSCLE	1980	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
DONQUAN	NP-6	MUSCLE	1980	(0.001	(0.001	0.004	0.004	(0.001	(0.001	(0.005
DONQUAN	WF-2	MUSCLE	1980	(0.001	(0.001	0.010	0.010	(0.001	(0.001	(0.005
DONQUAN	WF-3	MUSCLE	1980	(0.001	(0.001	0.002	0.002	(0.001	(0.001	(0.005
DONQUAN	WF-4	MUSCLE	1980	(0.001	(0.001	0.003	0.003	(0.001	(0.001	(0.005
DONQUAN	WF-5	MUSCLE	1980	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
DONQUAN	WF-6	MUSCLE	1980	(0.001	(0.001	0.001	0.010	(0.001	(0.001	(0.005
FONTENEAU	NP-1	BRAIN	1981	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005
FONTENEAU	WS-1	DIG TRACT	1981	(0.001	(0.001	0.002	0.002	(0.001	(0.001	0.006
FONTENEAU	WS-3	DIG TRACT	1981	(0.001	(0.001	0.004	0.004	(0.001	(0.001	0.020
FONTENEAU	WS-3	FAT	1981	(0.001	(0.001	0.048	0.048	(0.001	(0.001	0.011
FONTENEAU	M-1	GONADS	1981	(0.001	(0.001	0.006	0.006	(0.001	(0.001	0.005
FONTENEAU	M-3	GONADS	1981	(0.001	(0.001	0.005	0.005	(0.001	(0.001	0.005
FONTENEAU	NP-1	GONADS	1981	(0.001	(0.001	0.009	0.009	(0.001	(0.001	0.006
FONTENEAU	NP-12	GONADS	1981	(0.001	(0.001	0.020	0.020	(0.001	(0.001	0.005
FONTENEAU	NP-13	GONADS	1981	(0.001	(0.001	0.044	0.044	(0.001	(0.001	0.090
FONTENEAU	NP-15	GONADS	1981	(0.001	(0.001	0.005	0.005	(0.001	(0.001	0.007
FONTENEAU	NP-3	GONADS	1981	(0.001	(0.001	0.002	0.002	(0.001	(0.001	0.005
FONTENEAU	NP-5	GONADS	1981	(0.001	(0.001	0.065	0.065	(0.001	(0.001	0.010
FONTENEAU	NP-7	GONADS	1981	(0.001	(0.001	0.008	0.008	(0.001	(0.001	(0.005
FONTENEAU	NP-9	GONADS	1981	(0.001	(0.001	0.009	0.009	(0.001	(0.001	0.005
FONTENEAU	ST-1	GONADS	1981	(0.001	(0.001	0.003	0.003	(0.001	(0.001	(0.005
FONTENEAU	WS-1	GONADS	1981	(0.001	(0.001	0.005	0.005	(0.001	(0.001	0.005
FONTENEAU	M-1	LIVER	1981	0.001	(0.001	0.006	0.007	(0.001	(0.001	0.010
FONTENEAU	M-3	LIVER	1981	0.001	(0.001	0.001	0.002	(0.001	(0.001	0.013
FONTENEAU	NP-1	LIVER	1981	0.001	(0.001	0.030	0.031	(0.001	(0.001	0.023
FONTENEAU	NP-12	LIVER	1981	0.001	(0.001	0.003	0.004	(0.001	(0.001	0.017
FONTENEAU	NP-13	LIVER	1981	0.002	(0.001	0.006	0.008	(0.001	(0.001	0.048
FONTENEAU	NP-15	LIVER	1981	0.001	(0.001	0.008	0.009	(0.001	(0.001	0.008
FONTENEAU	NP-3	LIVER	1981	0.001	(0.001	0.001	0.002	(0.001	(0.001	0.019
FONTENEAU	NP-5	LIVER	1981	0.005	(0.001	0.020	0.007	(0.001	(0.001	0.091
FONTENEAU	NP-7	LIVER	1981	0.001	(0.001	0.001	0.002	(0.001	(0.001	0.007

TABLE 23. Chlorinated Hydrocarbon Pesticide and PCB residues in fish tissue from five southern Labrador lakes.

LAKE	SAMPLE NO.	TISSUE TYPE	YEAR SAMPLED	o,p'-DDT (mg/kg)	p,p'-DDD (mg/kg)	p,p-DDE (mg/kg)	T-DDT (mg/kg)	GAMMA-BHC (mg/kg)	ALPHA-BHC (mg/l)	TOTAL AROCHLORS (PCB's)
FONTENEAU	NP-9	LIVER	1981	0.001	(0.001	0.030	0.031	(0.001	0.002	0.019
FONTENEAU	ST-1	LIVER	1981	0.001	(0.001	0.001	0.002	(0.001	0.001	0.005
FONTENEAU	M-1	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	M-3	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-1	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-1	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-13	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-15	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-3	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-5	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-7	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	NP-9	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	ST-1	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	WS-1	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
FONTENEAU	WS-3	MUSCLE	1981	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005
BRULE	LT-3	FAT	1982	(0.001	(0.001	0.005	0.005	(0.001	0.001	0.057
BRULE	NP-1	FAT	1982	(0.001	(0.001	0.008	0.008	(0.001	0.001	0.026
BRULE	WF-2	FAT	1982	0.001	0.001	0.009	0.011	0.001	0.002	0.025
BRULE	LT-11	GONADS	1982	0.001	0.002	0.016	0.019	0.001	0.002	0.028
BRULE	LT-13	GONADS	1982	(0.001	0.001	0.044	0.044	0.001	0.001	0.040
BRULE	LT-14	GONADS	1982	(0.001	0.004	0.064	0.068	0.001	0.003	0.061
BRULE	LT-5	GONADS	1982	0.001	0.004	0.078	0.083	0.001	0.001	0.062
BRULE	LT-7	GONADS	1982	0.005	0.013	0.220	0.238	0.001	0.002	0.150
BRULE	NP-2	GONADS	1982	(0.001	(0.001	0.005	0.005	0.001	0.001	0.016
BRULE	NP-3	GONADS	1982	(0.001	0.004	0.015	0.019	0.001	0.001	0.057
BRULE	NP-6	GONADS	1982	(0.001	0.002	0.005	0.007	0.001	0.001	0.013
BRULE	OU-10	GONADS	1982	(0.001	(0.001	0.003	0.003	0.001	0.002	0.005
BRULE	OU-5	GONADS	1982	(0.001	(0.001	0.009	0.009	(0.001	0.001	0.027
BRULE	OU-8	GONADS	1982	(0.001	0.001	0.016	0.017	0.001	0.004	0.021
BRULE	WF-10	GONADS	1982	0.002	(0.001	0.010	0.012	0.001	0.014	0.029
BRULE	WF-12	GONADS	1982	(0.001	(0.001	0.013	0.013	0.001	0.011	0.016
BRULE	WF-14	GONADS	1982	0.001	0.002	0.007	0.008	0.001	0.010	0.037
BRULE	WF-6	GONADS	1982	0.001	(0.001	0.007	0.007	0.001	0.012	0.005
BRULE	WF-8	GONADS	1982	(0.001	(0.001	0.009	0.009	(0.001	0.004	(0.005
BRULE	WS-1	GONADS	1982	(0.001	(0.001	0.005	0.005	0.001	0.002	0.029
BRULE	WS-3	GONADS	1982	(0.001	(0.001	0.004	0.005	0.001	0.002	0.005
BRULE	WS-5	GONADS	1982	(0.001	0.001		0.001	(0.001	0.001	0.005
BRULE	WS-7	GONADS	1982	(0.001	(0.001	0.002	0.002	(0.001	0.003	(0.005
BRULE	WS-9	GONADS	1982	(0.001	(0.001	0.003	0.003	0.001	0.002	0.005
BRULE	LT-1	HEART	1982	(0.001	(0.001	0.033	0.033	(0.001	0.001	0.047
BRULE	LT-5	HEART	1982	(0.001	0.001	0.096	0.097	0.001	0.002	0.060
BRULE	LT-7	HEART	1982	0.003	0.006	0.140	0.149	0.001	0.001	0.095
BRULE	NP-2	HEART	1982	(0.001	0.001	0.004	0.005	(0.001	0.001	0.005
BRULE	NP-3	HEART	1982	(0.001	(0.001	0.003	0.003	(0.001	0.001	0.005
BRULE	OU-8	HEART	1982	(0.001	(0.001	0.002	0.002	(0.001	0.001	0.005
BRULE	LT-1	LIVER	1982	(0.001	0.012	0.160	0.172	0.001	0.003	0.060
BRULE	LT-11	LIVER	1982	(0.001	0.002	0.056	0.058	0.001	0.002	0.052
BRULE	LT-13	LIVER	1982	(0.001	(0.001	0.091	0.091	0.001	0.002	0.039
BRULE	LT-14	LIVER	1982	(0.001	0.005	0.045	0.050	0.001	0.004	0.032
BRULE	LT-15	LIVER	1982	(0.001	(0.001	0.320	0.320	(0.001	0.033	0.180
BRULE	LT-3	LIVER	1982	(0.001	(0.001	0.140	0.140	(0.001	0.003	0.093
BRULE	LT-5	LIVER	1982	(0.001	0.012	0.160	0.172	0.001	0.003	0.110
BRULE	LT-6	LIVER	1982	(0.001	(0.001	0.070	0.070	0.001	0.002	0.140

TABLE 23. Chlorinated Hydrocarbon Pesticide and PCB residues in fish tissue from five southern Labrador lakes.

LAKE	SAMPLE NO.	TISSUE TYPE	YEAR SAMPLED	o,p'-DDT (mg/kg)	p,p'-DDD (mg/kg)	p,p-DDE (mg/kg)	T-DDT (mg/kg)	GAMMA-BHC (mg/kg)	ALPHA-BHC (mg/kg)	TOTAL AROCHLOR (PCB's)	% LIPID
BRULE	LT-7	LIVER	1982	(0.001	0.050	0.820	0.870	0.001	0.003	0.210	
BRULE	LT-8	LIVER	1982	(0.001	0.010	0.045	0.055	0.001	0.017	0.110	
BRULE	NP-1	LIVER	1982	(0.001	(0.001	0.068	0.068	0.003	0.013	0.070	
BRULE	NP-2	LIVER	1982	(0.001	0.027	0.071	0.098	0.001	0.014	0.100	
BRULE	NP-3	LIVER	1982	(0.001	0.015	0.050	0.065	0.001	0.004	0.091	
BRULE	NP-6	LIVER	1982	(0.001	0.004	0.014	0.018	0.001	0.004	0.019	
BRULE	OU-10	LIVER	1982	(0.001	0.002	0.002	0.004	0.001	0.004	0.005	
BRULE	OU-3	LIVER	1982	(0.001	0.001	0.007	0.008	0.001	0.002	0.016	
BRULE	OU-5	LIVER	1982	(0.001	0.001	0.005	0.006	(0.001	0.001	0.014	
BRULE	OU-8	LIVER	1982	(0.001	0.001	0.004	0.005	0.001	0.002	0.005	
BRULE	WF-10	LIVER	1982	(0.001	0.001	0.003	0.004	0.001	0.003	0.005	
BRULE	WF-12	LIVER	1982	(0.001	0.001	0.003	0.004	0.001	0.003	0.005	
BRULE	WF-14	LIVER	1982	(0.001	0.001	0.005	0.006	0.001	0.003	(0.005	
BRULE	WF-2	LIVER	1982	(0.001	(0.001	0.014	0.014	(0.001	0.002	(0.005	
BRULE	WF-6	LIVER	1982	(0.001	(0.001	0.004	0.004	(0.001	0.004	0.023	
BRULE	WF-8	LIVER	1982	(0.001	(0.001	0.011	0.011	(0.001	0.003	0.005	
BRULE	WS-1	LIVER	1982	(0.001	(0.001	0.011	0.011	0.001	0.005	0.005	
BRULE	WS-11	LIVER	1982	(0.001	(0.001		(0.001	(0.001	0.001	(0.005	
BRULE	WS-3	LIVER	1982	(0.001	0.006	0.012	0.018	(0.001	0.003	0.005	
BRULE	WS-5	LIVER	1982	(0.001	0.001	0.004	0.005	0.001	0.003	0.016	
BRULE	WS-7	LIVER	1982	(0.001	(0.001	0.003	0.003	(0.001	0.004	(0.005	
BRULE	WS-9	LIVER	1982	(0.001	(0.001	0.010	0.010	0.001	0.003	0.020	
BRULE	LT-1	MUSCLE	1982	0.001	0.003	0.043	0.047	(0.001	0.001	0.026	
BRULE	LT-11	MUSCLE	1982	(0.001	(0.001	0.001	0.001	0.001	0.001	0.005	
BRULE	LT-13	MUSCLE	1982	(0.001	(0.001	0.015	0.015	0.001	0.001	0.020	
BRULE	LT-3	MUSCLE	1982	0.001	(0.001	0.015	0.016	(0.001	0.001	0.037	
BRULE	LT-5	MUSCLE	1982	(0.001	0.005	0.079	0.084	0.001	0.002	0.073	
BRULE	LT-7	MUSCLE	1982	0.006	0.014	0.440	0.460	0.001	0.002	0.100	
BRULE	LT-8	MUSCLE	1982	(0.001	(0.001	0.002	0.002	(0.001	0.001	(0.005	
BRULE	NP-1	MUSCLE	1982	(0.001	(0.001	0.001	0.001	(0.001	0.001	0.005	
BRULE	NP-2	MUSCLE	1982	(0.001	0.001	0.002	0.003	0.001	0.001	0.005	
BRULE	NP-3	MUSCLE	1982	0.001	(0.001	0.004	0.005	(0.001	0.001	0.005	
BRULE	NP-6	MUSCLE	1982	(0.001	(0.001	0.001	0.001	(0.001	0.001	0.005	
BRULE	OU-8	MUSCLE	1982	(0.001	(0.001	0.001	0.001	0.001	0.001	0.005	
BRULE	WF-10	MUSCLE	1982	(0.001	(0.001	0.001	0.001	0.001	0.001	0.005	
BRULE	WF-12	MUSCLE	1982	(0.001	0.001	0.002	0.003	0.001	0.001	0.005	
BRULE	WF-14	MUSCLE	1982	(0.001	(0.001	0.002	0.002	(0.001	0.001	(0.005	
BRULE	WF-2	MUSCLE	1982	(0.001	(0.001	0.007	0.007	0.001	0.002	0.007	
BRULE	WF-6	MUSCLE	1982	(0.001	0.001	0.002	0.003	0.001	0.001	(0.005	
BRULE	WF-8	MUSCLE	1982	(0.001	(0.001	0.004	0.004	(0.001	0.001	(0.005	
BRULE	WS-1	MUSCLE	1982	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	
BRULE	WS-11	MUSCLE	1982	(0.001	(0.001		(0.001	(0.001	0.001	0.005	
BRULE	WS-3	MUSCLE	1982	0.001	(0.001	0.007	0.008	(0.001	0.002	(0.005	
BRULE	WS-5	MUSCLE	1982	(0.001	0.001	0.002	0.003	(0.001	0.001	0.005	
BRULE	WS-7	MUSCLE	1982	(0.001	(0.001	0.001	0.001	0.001	0.002	0.005	
BRULE	WS-9	MUSCLE	1982	0.001	0.001	0.002	0.004	(0.001	0.001	0.005	
ST AUGUSTIN	NP-1	GONADS	1983	(0.001	0.001	0.010	0.010	(0.001	0.001	0.023	2.70
ST AUGUSTIN	NP-11	GONADS	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	4.80
ST AUGUSTIN	NP-13	GONADS	1983	0.001	0.001	0.017	0.019	(0.001	0.001	0.018	4.50
ST AUGUSTIN	NP-3	GONADS	1983	0.002	0.001	0.027	0.030	(0.001	0.001	0.019	2.90
ST AUGUSTIN	NP-6	GONADS	1983	(0.001	0.001	0.012	0.013	(0.001	0.001	0.012	1.60
ST AUGUSTIN	NP-8	GONADS	1983	0.001	0.001	0.015	0.017	(0.001	0.001		

TABLE 23. Chlorinated Hydrocarbon Pesticide and PCB residues in fish tissue from five southern Labrador lakes.

LAKE	SAMPLE NO.	TISSUE TYPE	YEAR SAMPLED	o,p'-DDT (mg/kg)	p,p'-DDD (mg/kg)	p,p-DDE (mg/kg)	T-DDT (mg/kg)	GAMMA-BHC (mg/kg)	ALPHA-BHC (mg/kg)	TOTAL AROCHLOR (PCB's)	% LIPID
ST AUGUSTIN	NP-9	GONADS	1983	(0.001	0.001	0.008	0.009	(0.001	0.001	0.011	3.00
ST AUGUSTIN	NP-1	LIVER	1983	0.002	0.003	0.078	0.083	(0.001	0.003	0.046	7.80
ST AUGUSTIN	NP-11	LIVER	1983	0.031	0.017	0.200	0.248	(0.001	0.010	0.190	15.10
ST AUGUSTIN	NP-13	LIVER	1983	0.020	0.010	0.084	0.114	(0.001	0.008	0.098	
ST AUGUSTIN	NP-3	LIVER	1983	0.008	0.006	0.110	0.124	(0.001	0.006	0.130	12.20
ST AUGUSTIN	NP-6	LIVER	1983	0.005	0.008	0.077	0.090	(0.001	0.006	0.065	5.30
ST AUGUSTIN	NP-8	LIVER	1983	0.003	0.009	0.093	0.105	(0.001	0.005	0.072	11.70
ST AUGUSTIN	NP-9	LIVER	1983	0.002	0.003	0.033	0.038	(0.001	0.005	0.025	9.00
ST AUGUSTIN	NS-2	LIVER	1983	0.001	0.001	0.008	0.010	(0.001	0.004	0.005	8.30
ST AUGUSTIN	NS-5	LIVER	1983	(0.001	(0.001	0.003	0.003	(0.001	0.002	(0.005	2.70
ST AUGUSTIN	NP-1	MUSCLE	1983	0.003	0.002	0.055	0.060	(0.001	0.001	0.037	1.00
ST AUGUSTIN	NP-11	MUSCLE	1983	0.001	0.001	0.010	0.012	(0.001	0.001	0.005	1.50
ST AUGUSTIN	NP-13	MUSCLE	1983	0.001	(0.001	0.006	0.007	(0.001	0.001	0.005	2.00
ST AUGUSTIN	NP-3	MUSCLE	1983	(0.001	0.001	0.007	0.008	(0.001	0.001	(0.005	1.70
ST AUGUSTIN	NP-6	MUSCLE	1983	0.002	0.002	0.023	0.027	(0.001	0.002	0.014	4.00
ST AUGUSTIN	NP-8	MUSCLE	1983	0.001	0.001	0.015	0.017	(0.001	0.001	0.005	2.70
ST AUGUSTIN	NP-9	MUSCLE	1983	(0.001	(0.001	0.003	0.003	(0.001	0.001	(0.005	2.00
ST AUGUSTIN	ST-1	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	
ST AUGUSTIN	ST-5	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	2.60
ST AUGUSTIN	NS-12	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.50
ST AUGUSTIN	NS-13	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.40
ST AUGUSTIN	NS-15	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.50
ST AUGUSTIN	NS-2	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.40
ST AUGUSTIN	NS-3	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.60
ST AUGUSTIN	NS-5	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.30
ST AUGUSTIN	NS-6	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.50
ST AUGUSTIN	NS-7	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.40
ST AUGUSTIN	NS-9	MUSCLE	1983	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.60
ST PAUL	LS-10	MUSCLE	1984	(0.001	(0.001	0.004	0.004	(0.001	(0.001	(0.005	2.83
ST PAUL	LS-11	MUSCLE	1984	(0.001	0.001	0.003	0.004	(0.001	(0.001	(0.005	1.66
ST PAUL	LS-12	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005	2.64
ST PAUL	LS-13	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	0.97
ST PAUL	LS-14	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.55
ST PAUL	LS-15	MUSCLE	1984	(0.001	0.002	0.007	0.009	(0.001	0.001	(0.005	3.14
ST PAUL	LS-16	MUSCLE	1984	(0.001	0.001	0.003	0.004	(0.001	0.001	(0.005	2.43
ST PAUL	LS-17	MUSCLE	1984	(0.001	0.001	0.002	0.003	(0.001	0.001	(0.005	2.09
ST PAUL	LS-18	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.18
ST PAUL	LS-19	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.07
ST PAUL	LS-20	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005	1.52
ST PAUL	LS-21	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005	1.98
ST PAUL	LS-22	MUSCLE	1984	(0.001	0.001	0.007	0.008	(0.001	0.001	(0.005	2.91
ST PAUL	LS-23	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	0.002	(0.005	2.78
ST PAUL	NP-1	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	0.95
ST PAUL	ST-1	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.78
ST PAUL	ST-10	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.56
ST PAUL	ST-12	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.61
ST PAUL	ST-13	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.42
ST PAUL	ST-2	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.38
ST PAUL	ST-3	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.18
ST PAUL	ST-4	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.78
ST PAUL	ST-5	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.53

TABLE 23. Chlorinated Hydrocarbon Pesticide and PCB residues in fish tissue from five southern Labrador lakes.

LAKE	SAMPLE NO.	TISSUE TYPE	YEAR SAMPLED	o,p'-DDT (mg/kg)	p,p'-DDD (mg/kg)	p,p-DDE (mg/kg)	T-DDT (mg/kg)	GAMMA-BHC (mg/kg)	ALPHA-BHC (mg/kg)	TOTAL AROCHLORS (PCB's)	% LIPID
ST PAUL	ST-6	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.83
ST PAUL	ST-7	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.58
ST PAUL	ST-8	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.59
ST PAUL	ST-9	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.87
ST PAUL	WS-1	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	0.001	(0.005	2.68
ST PAUL	WS-10	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.67
ST PAUL	WS-11	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.14
ST PAUL	WS-12	MUSCLE	1984	(0.001	(0.001	0.002	0.002	(0.001	0.001	(0.005	1.77
ST PAUL	WS-13	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	0.001	(0.005	1.37
ST PAUL	WS-14	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.83
ST PAUL	WS-15	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.64
ST PAUL	WS-16	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	(0.001	(0.005	1.47
ST PAUL	WS-2	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	0.002	(0.005	3.80
ST PAUL	WS-3	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	2.02
ST PAUL	WS-4	MUSCLE	1984	(0.001	0.001	0.004	0.005	(0.001	0.001	(0.005	1.72
ST PAUL	WS-5	MUSCLE	1984	(0.001	0.001	0.002	0.003	(0.001	0.001	(0.005	1.82
ST PAUL	WS-6	MUSCLE	1984	(0.001	(0.001	0.001	0.001	(0.001	0.001	(0.005	1.76
ST PAUL	WS-7	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.91
ST PAUL	WS-8	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	1.59
ST PAUL	WS-9	MUSCLE	1984	(0.001	(0.001	(0.001	(0.001	(0.001	(0.001	(0.005	2.00

UNGAVA BAY
TRANSBOUNDARY BASINS
QUEBEC – LABRADOR
SCALE
km 30 15 0 30 60 km
QUEBEC
LABRADOR SEA
LABRADOR
Fraser River
Smallwood Reservoir
Churchill River
GOOSE BAY
Hamilton River
Eagle River
CARTWRIGHT
Inlet
WABUSH
Little
Belle Isle
Strait of Belle Isle
ST ANTHONY

FIGURE 1

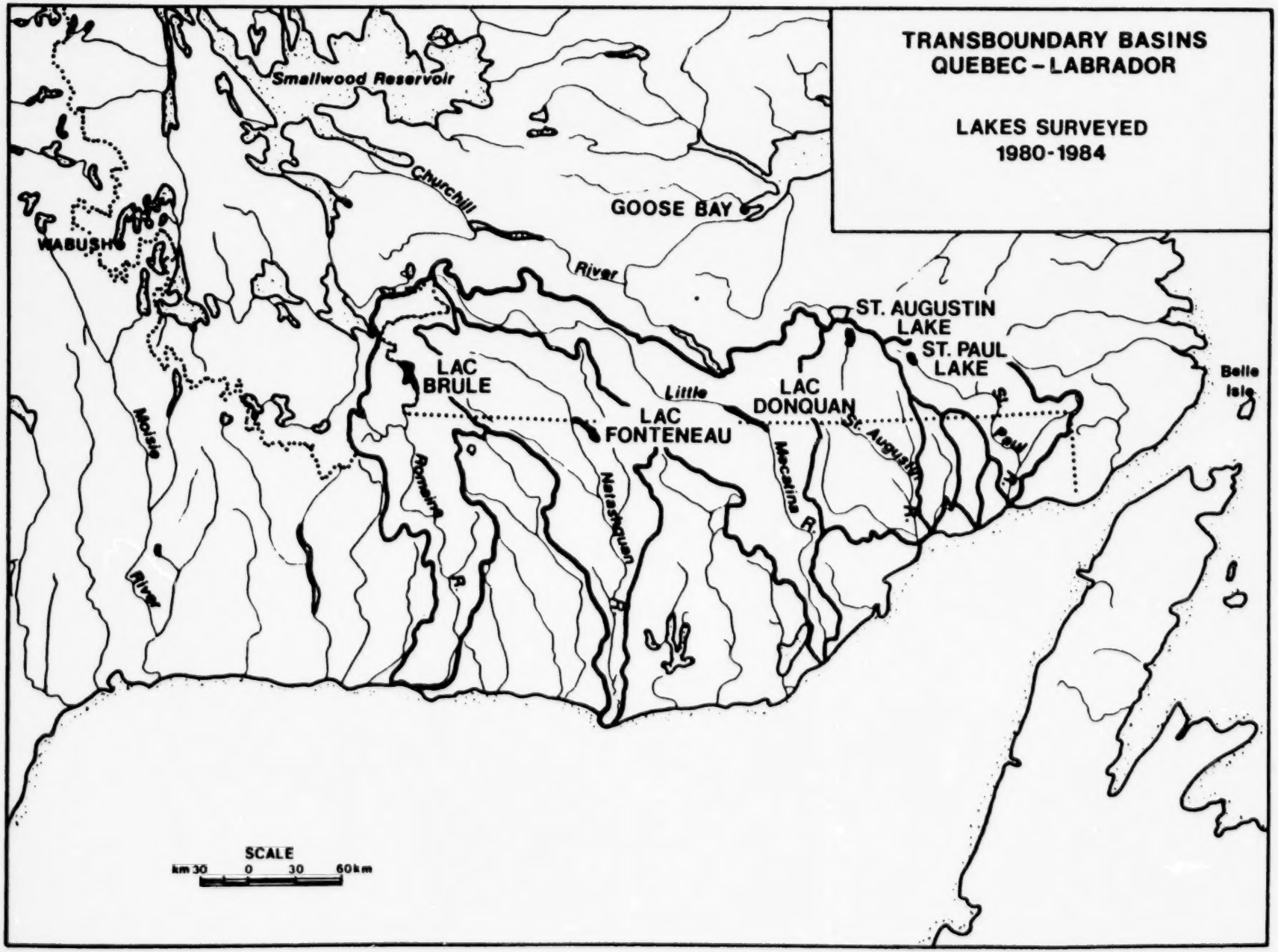

TRANSBOUNDARY BASINS
QUEBEC - LABRADOR
LAKES SURVEYED
1980-1984
Smallwood Reservoir
Churchill
River
GOOSE BAY
WABUSH
ST. AUGUSTIN
LAKE
ST. PAUL
LAKE
LAC
BRULE
LAC
FONTENEAU
LAC
DONQUAN
Little
St. Augustin
Belle Isle
Moisie
River
Romaine R.
Natashquan
Mecatina R.
SCALE
km 30 0 30 60 km

FIGURE 2

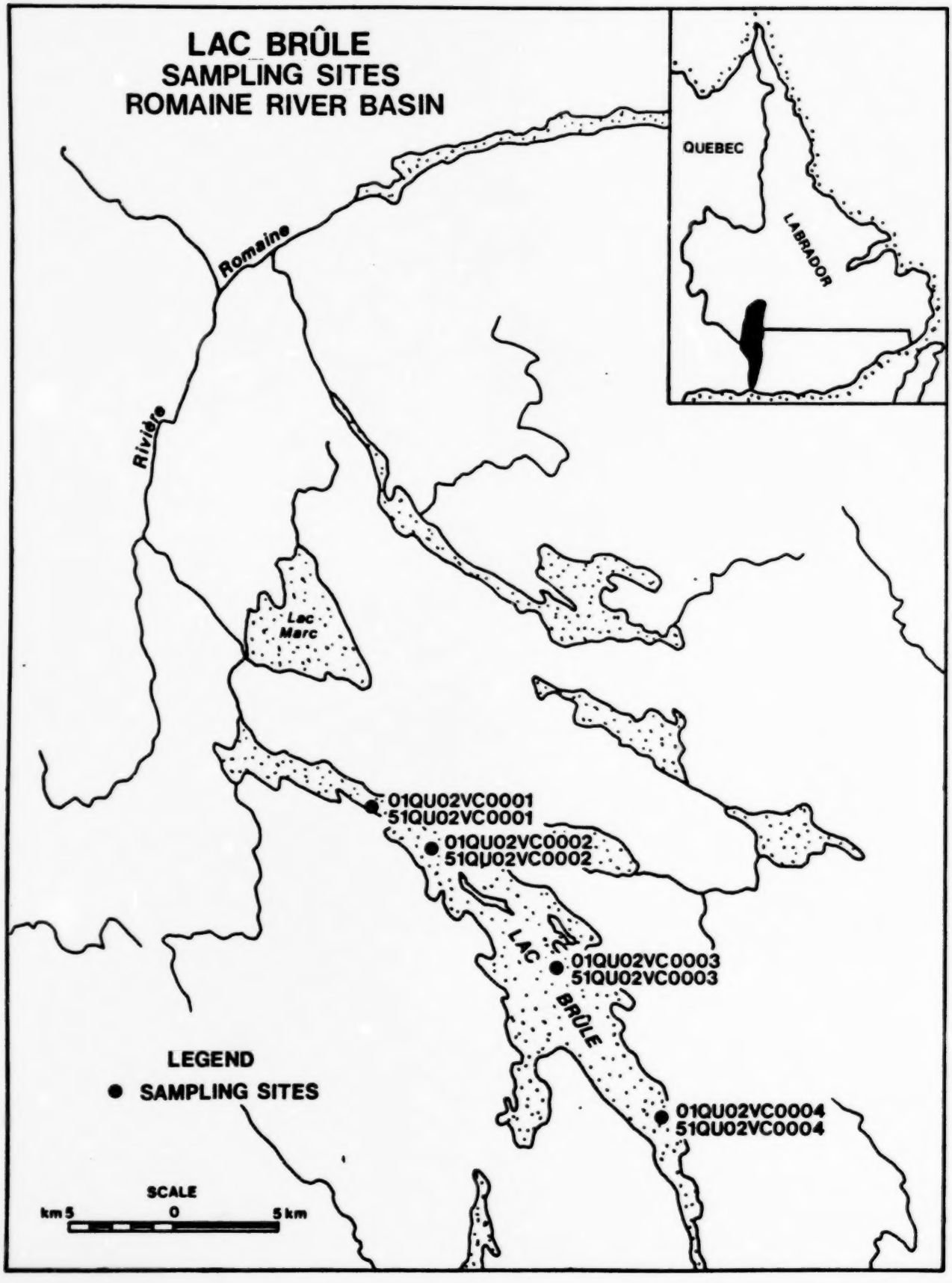

LAC BRÛLE
SAMPLING SITES
ROMAINE RIVER BASIN
QUEBEC
LABRADOR
Romaine
Rivière
Lac Marc
01QU02VC0001
51QU02VC0001
01QU02VC0002
51QU02VC0002
LAC BRÛLE
01QU02VC0003
51QU02VC0003
01QU02VC0004
51QU02VC0004
LEGEND
SAMPLING SITES
SCALE
km 5 0 5 km

FIGURE 3

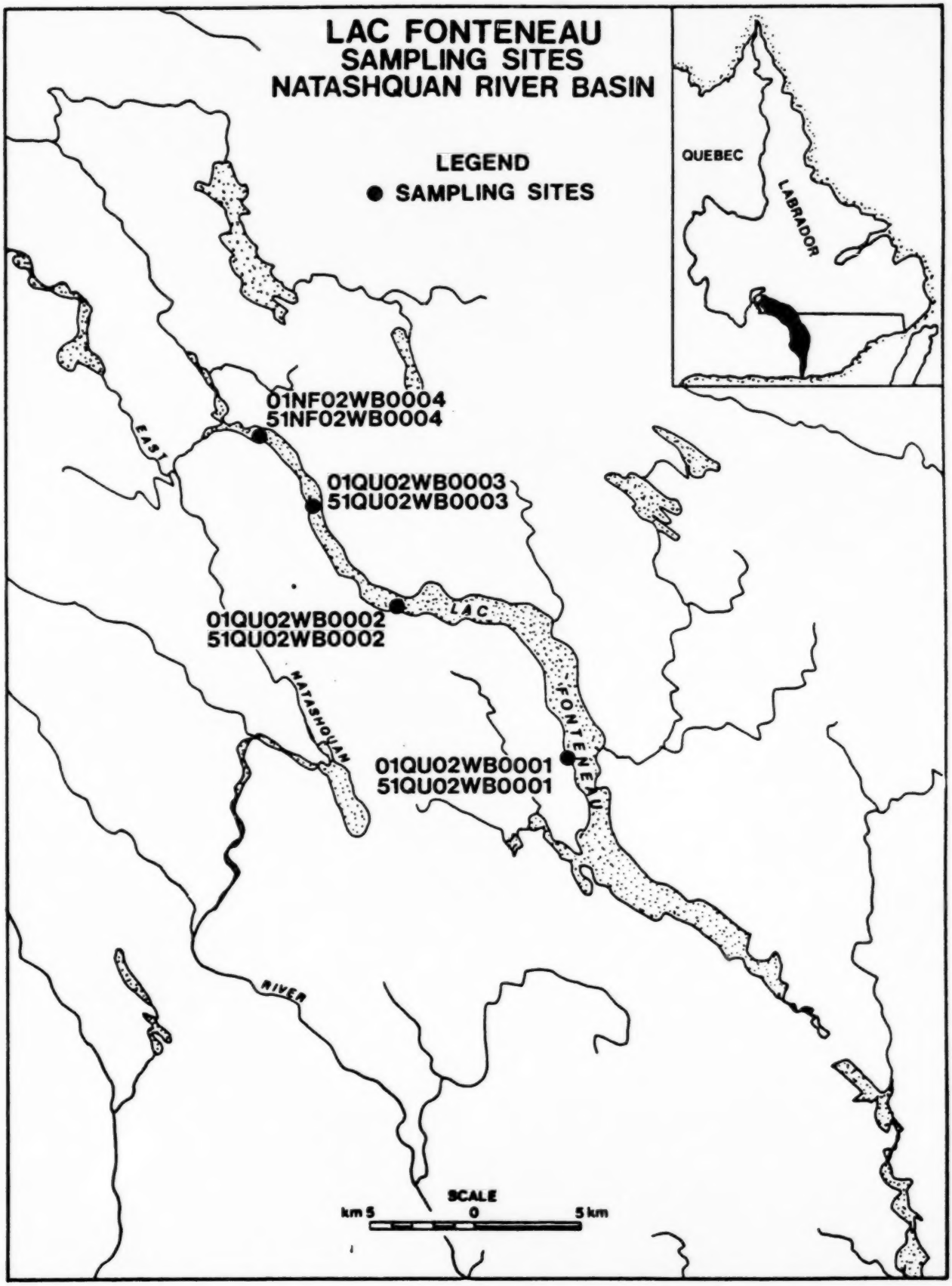

LAC FONTENEAU
SAMPLING SITES
NATASHQUAN RIVER BASIN
LEGEND
SAMPLING SITES
QUEBEC
LABRADOR
01NF02WB0004
51NF02WB0004
01QU02WB0003
51QU02WB0003
01QU02WB0002
51QU02WB0002
01QU02WB0001
51QU02WB0001
EAST
LAC
FONTENEAU
NATASHQUAN
RIVER
SCALE
km 5
0
5 km

FIGURE 4

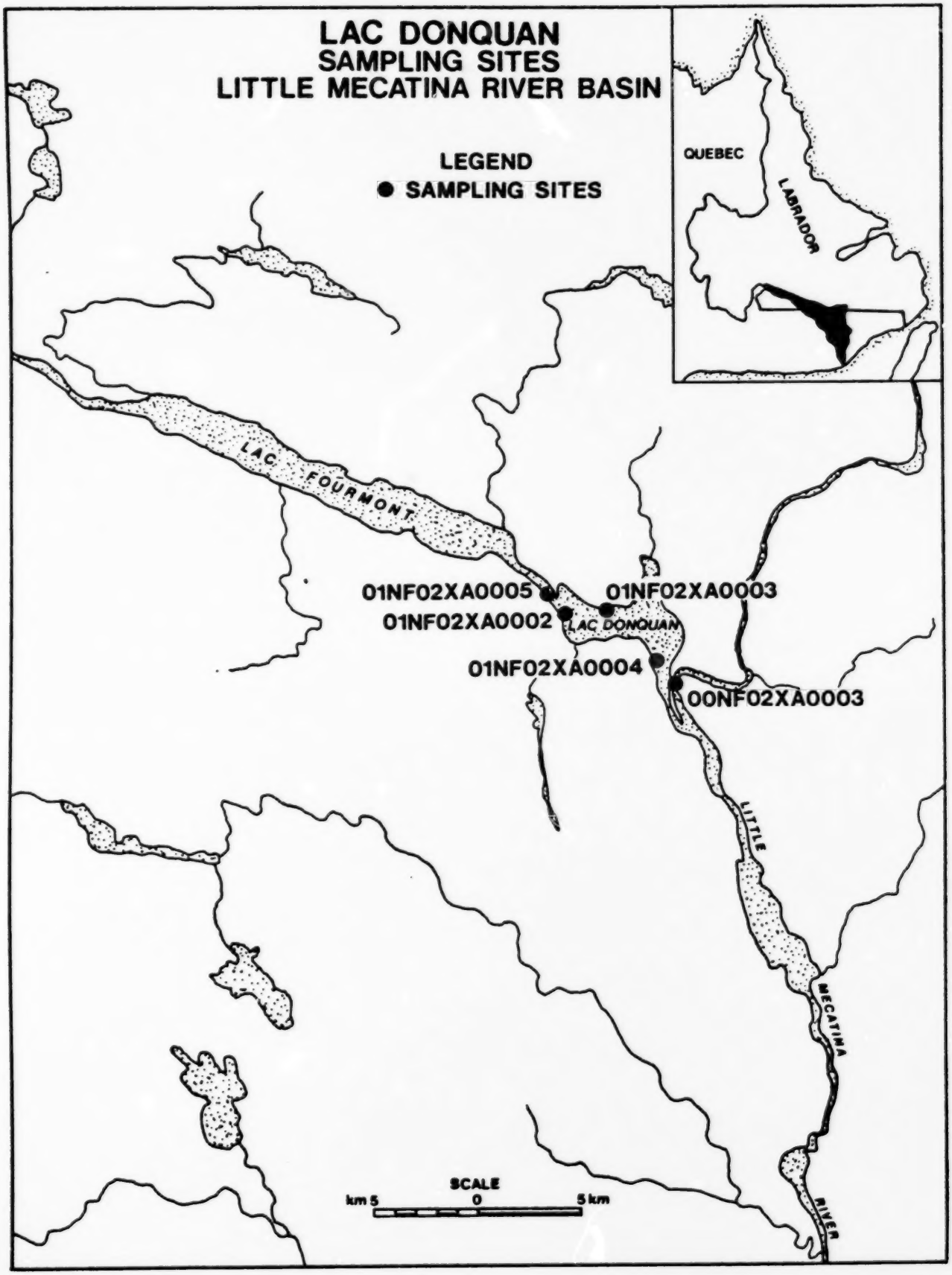

LAC DONQUAN
SAMPLING SITES
LITTLE MECATINA RIVER BASIN
LEGEND
SAMPLING SITES
QUEBEC
LABRADOR
LAC FOURMONT
01NF02XA0005
01NF02XA0003
01NF02XA0002
LAC DONQUAN
01NF02XA0004
00NF02XA0003
LITTLE
MECATINA
RIVER
SCALE
km 5
0
5 km

FIGURE 5

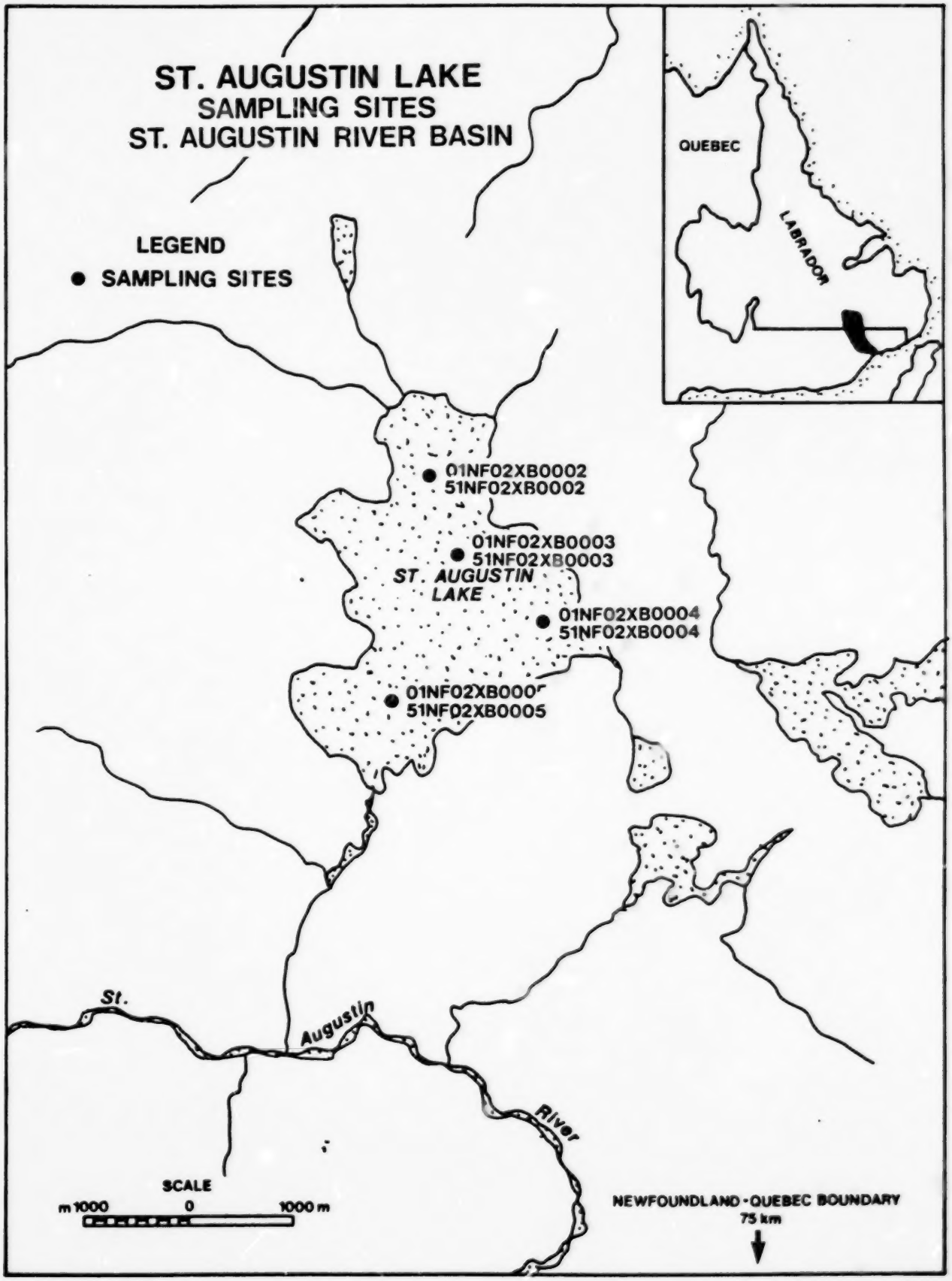

ST. AUGUSTIN LAKE
SAMPLING SITES
ST. AUGUSTIN RIVER BASIN
LEGEND
SAMPLING SITES
QUEBEC
LABRADOR
01NF02XB0002
51NF02XB0002
01NF02XB0003
51NF02XB0003
ST. AUGUSTIN LAKE
01NF02XB0004
51NF02XB0004
01NF02XB0005
51NF02XB0005
St. Augustin River
SCALE
m 1000 0 1000 m
NEWFOUNDLAND - QUEBEC BOUNDARY
75 km

FIGURE 6

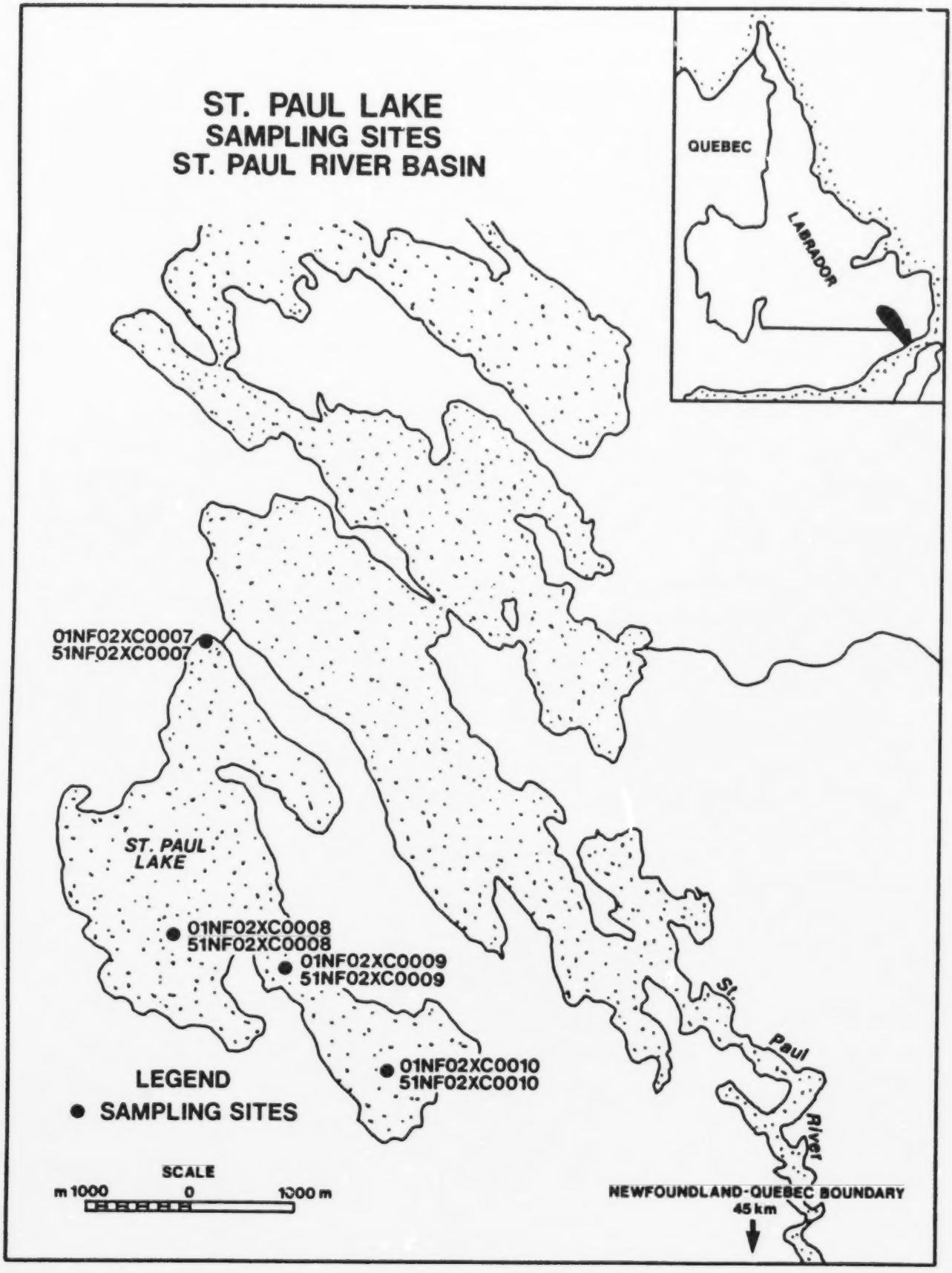

ST. PAUL LAKE
SAMPLING SITES
ST. PAUL RIVER BASIN
QUEBEC
LABRADOR
01NF02XC0007
51NF02XC0007
ST. PAUL LAKE
01NF02XC0008
51NF02XC0008
01NF02XC0009
51NF02XC0009
01NF02XC0010
51NF02XC0010
St. Paul River
LEGEND
SAMPLING SITES
SCALE
m 1000 0 1000 m
NEWFOUNDLAND-QUEBEC BOUNDARY
45 km

FIGURE 7

FIG.7
WATER COLOR OF
FIVE SOUTHERN LABRADOR LAKES

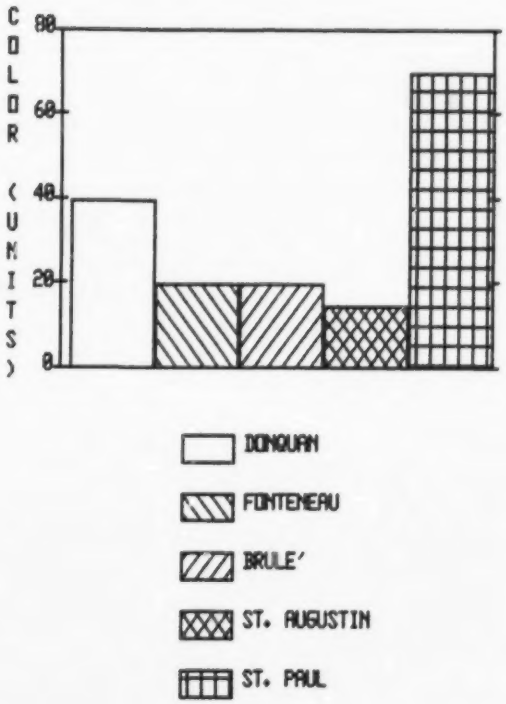


FIG.8
EXTRACTABLE IRON IN WATERS OF
FIVE SOUTHERN LABRADOR LAKES

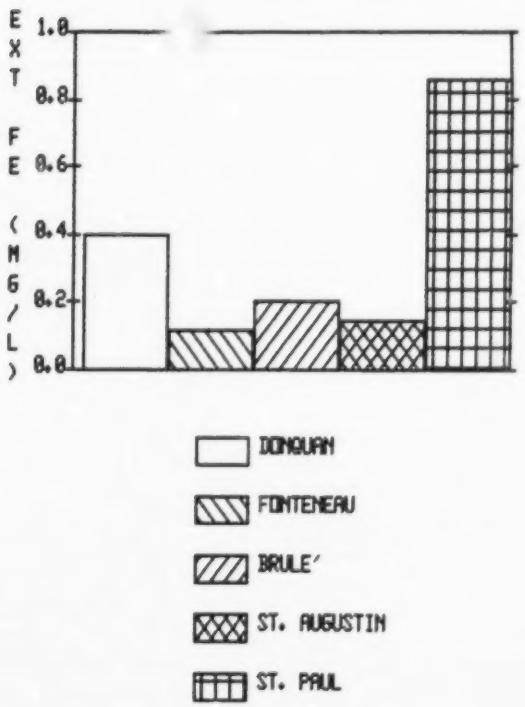


FIG.9
PH (LAB MEASURED) OF WATERS OF
FOUR SOUTHERN LABRADOR LAKES

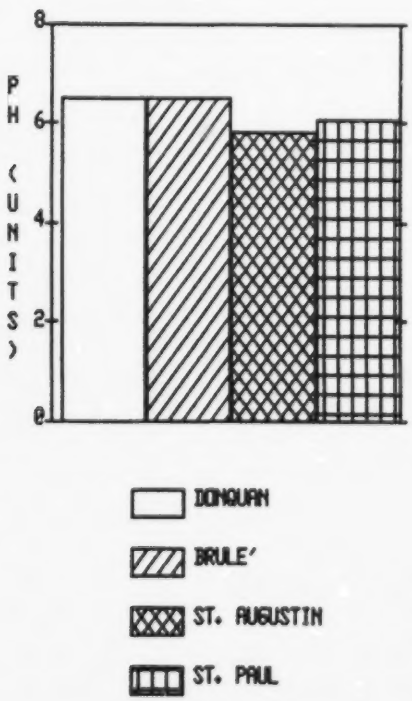


FIG.10
TOTAL ALKALINITY OF WATERS OF
FIVE SOUTHERN LABRADOR LAKES

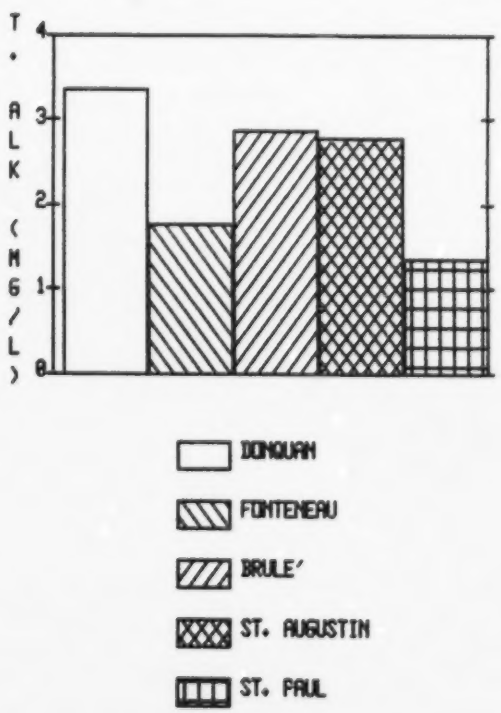


FIG.11
SUM OF CONSTITUENTS (PPM) IN WATERS OF FIVE SOUTHERN LABRADOR LAKES

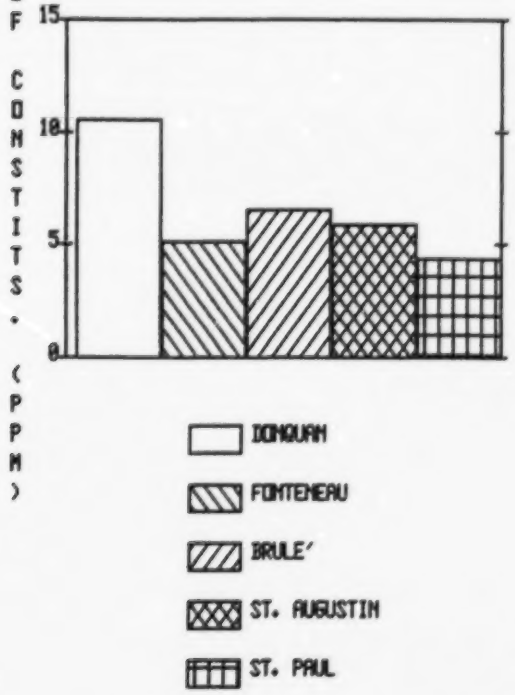


FIG.12
LAKE DRAINAGE BASIN AREA IN SQUARE KILOMETERS OF FIVE SOUTHERN LABRADOR LAKES

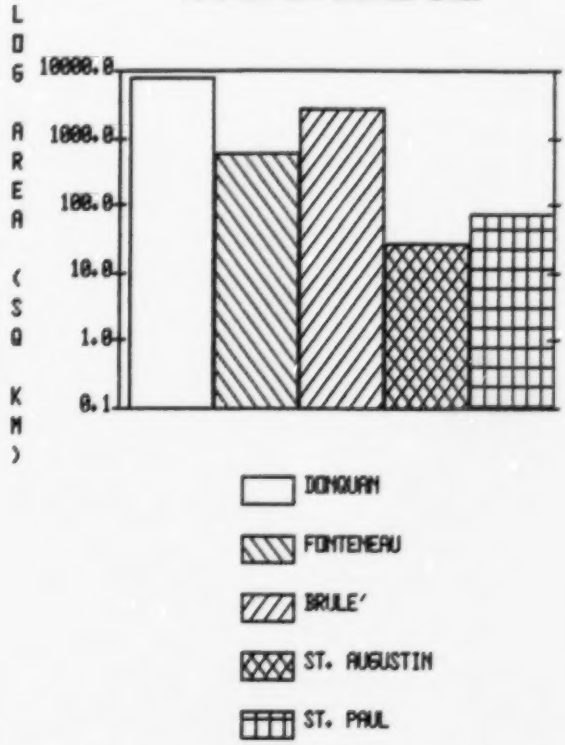
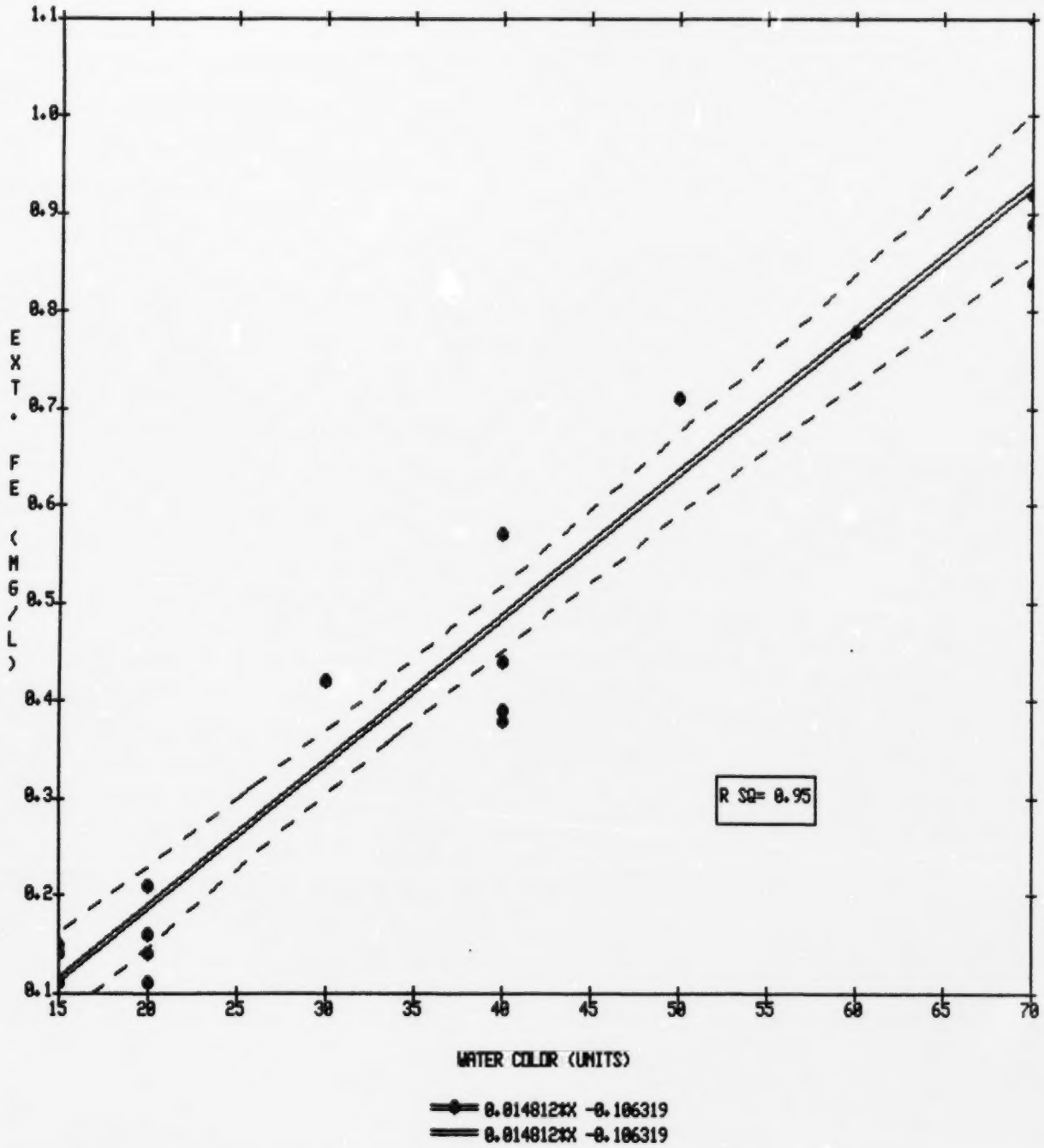


FIG.13
MAJOR IONIC COMPOSITION OF WATER OF
FIVE SOUTHERN LABRADOR LAKES

FIG.14
EXTRACTABLE IRON VS WATER COLOR IN
FIVE SOUTHERN LABRADOR LAKES



NOTE:DASHED LINES ARE 95% CONFIDENCE
LIMITS OF THE REGRESSION LINE.

FIG.15
MEDIAN AND RANGE OF TOTAL HG
IN BOTTOM SEDIMENTS OF
FIVE SOUTHERN LABRADOR LAKES

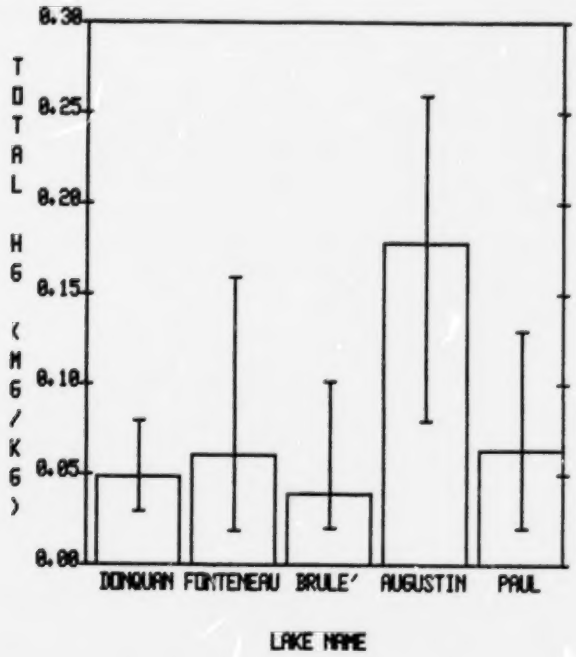
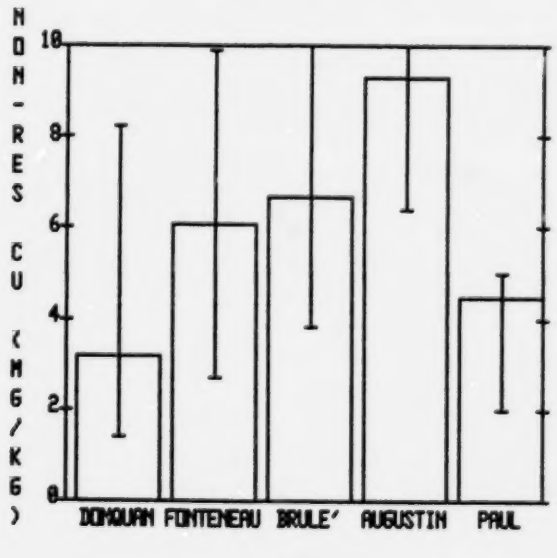
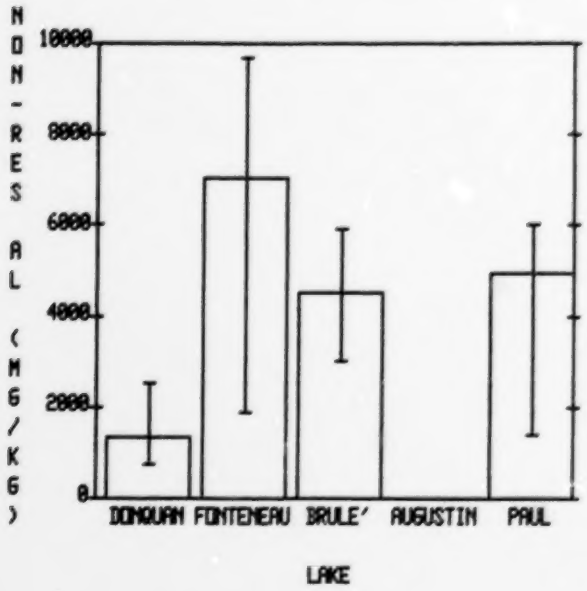


FIG.16
MEDIAN AND RANGE OF NON-RESIDUAL CU
IN BOTTOM SEDIMENTS OF
FIVE SOUTHERN LABRADOR LAKES



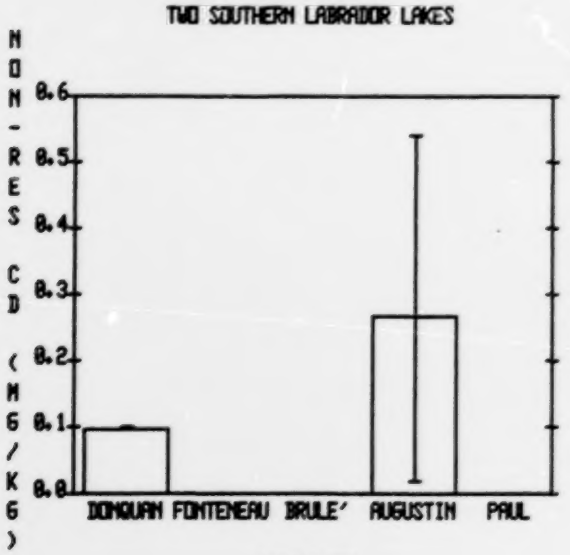
NOTE: BOTTOM SEDIMENTS FROM ST AUGUSTIN
LAKE WERE ANALYZED FOR TOTAL CU.

FIG.17
MEDIAN AND RANGE OF NON-RESIDUAL ALUMINUM
IN BOTTOM SEDIMENTS OF
FOUR SOUTHERN LABRADOR LAKES



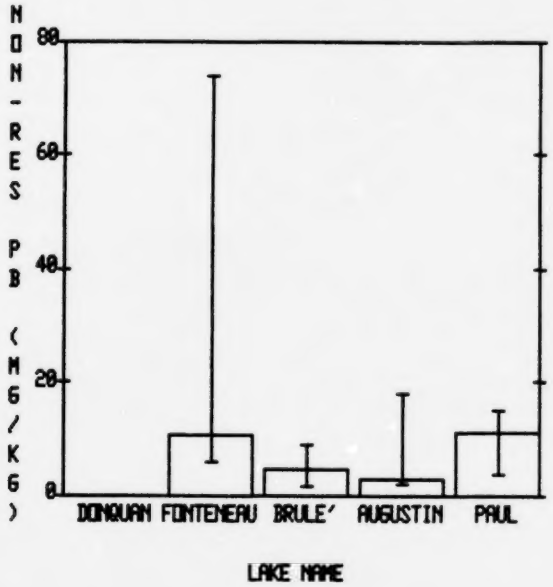
NOTE: BOTTOM SEDIMENTS FROM ST AUGUSTIN LAKE WERE NOT ANALYZED FOR AL.

FIG.18
MEDIAN AND RANGE OF NON-RESIDUAL CD
IN BOTTOM SEDIMENTS OF
TWO SOUTHERN LABRADOR LAKES



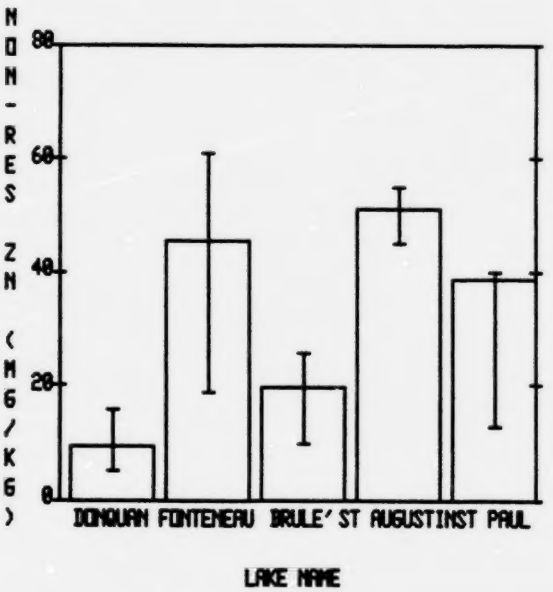
NOTE: BOTTOM SEDIMENTS FROM LAC DONQUAN WERE ANALYZED FOR NON-RESIDUAL CD WHILE THOSE FROM ST AUGUSTIN LAKE WERE ANALYZED FOR TOTAL CD.

FIG.19
MEDIAN AND RANGE OF NON-RESIDUAL PB
IN BOTTOM SEDIMENTS OF
FOUR SOUTHERN LABRADOR LAKES



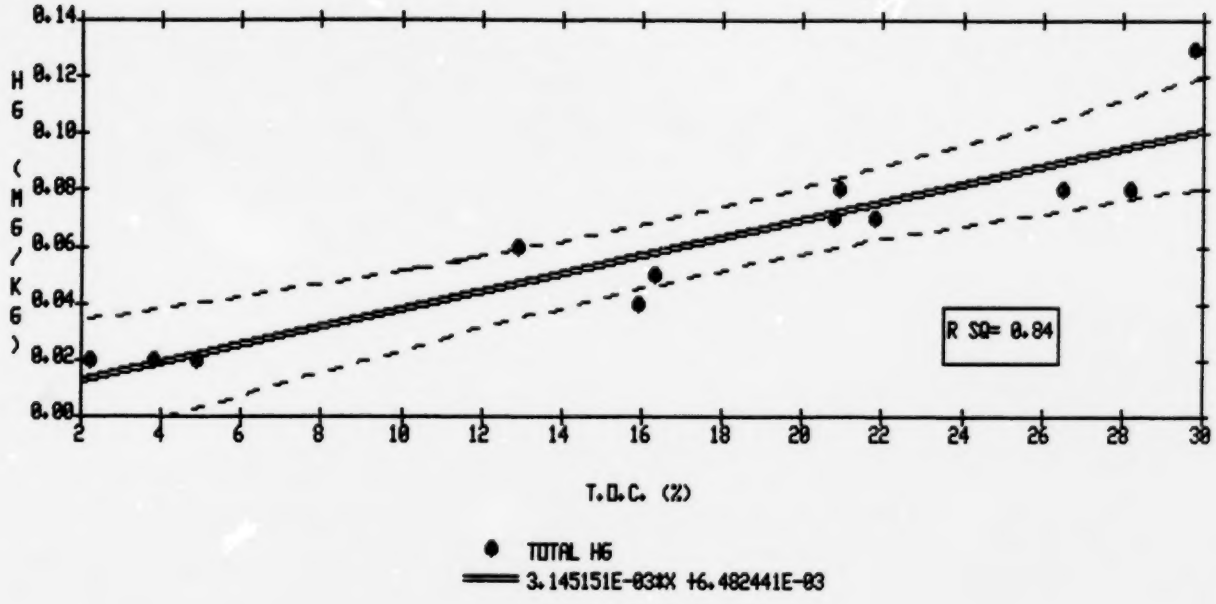
NOTE: BOTTOM SEDIMENTS FROM ST AUGUSTIN LAKE WERE ANALYZED FOR TOTAL PB.

FIG.20
MEDIAN AND RANGE OF NON-RESIDUAL ZN
IN BOTTOM SEDIMENTS OF
FIVE SOUTHERN LABRADOR LAKES



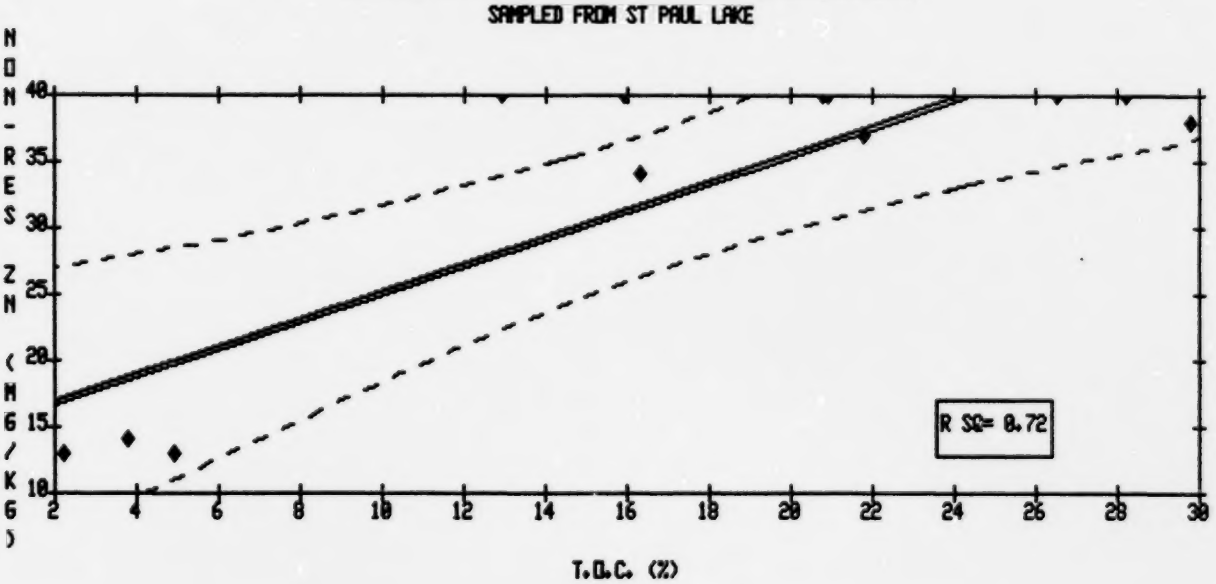
NOTE: BOTTOM SEDIMENTS FROM ST AUGUSTIN LAKE WERE ANALYZED FOR TOTAL ZN.

FIG.21
HG VS TOTAL ORGANIC CARBON IN BOTTOM SEDIMENTS
SAMPLED FROM ST PAUL LAKE



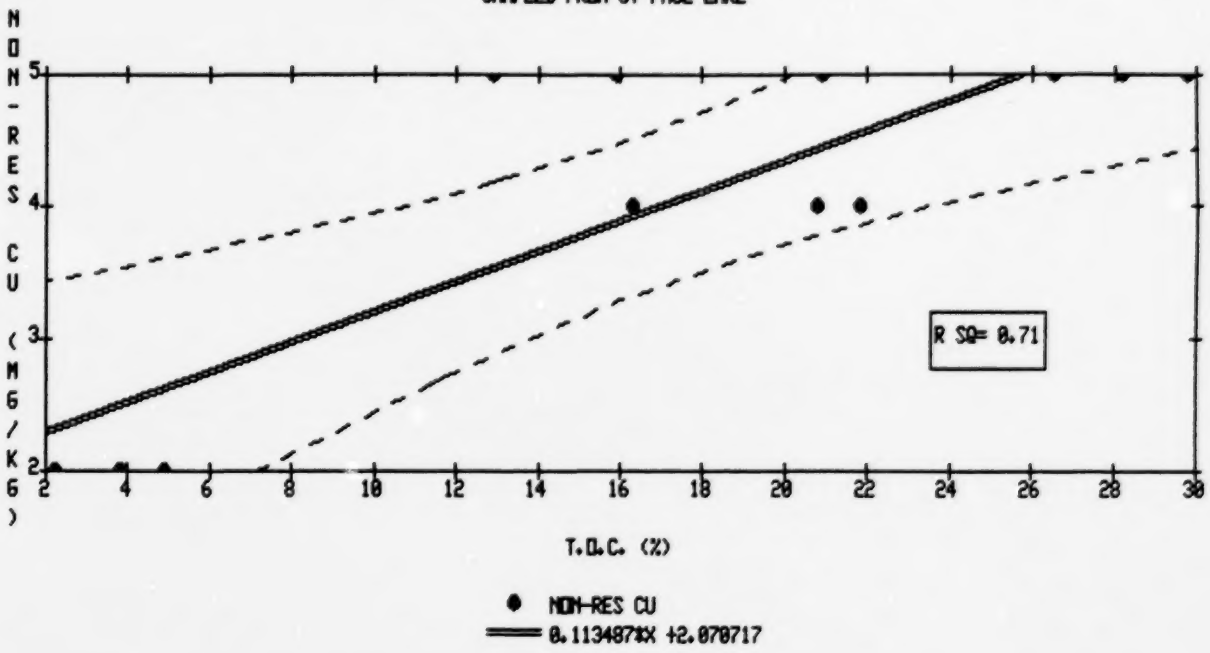
NOTE: DASHED LINES ARE 95% CONFIDENCE
LIMITS OF THE REGRESSION LINE.

FIG.22
NON-RES ZN VS TOTAL ORGANIC CARBON IN BOTTOM SEDIMENTS
SAMPLED FROM ST PAUL LAKE



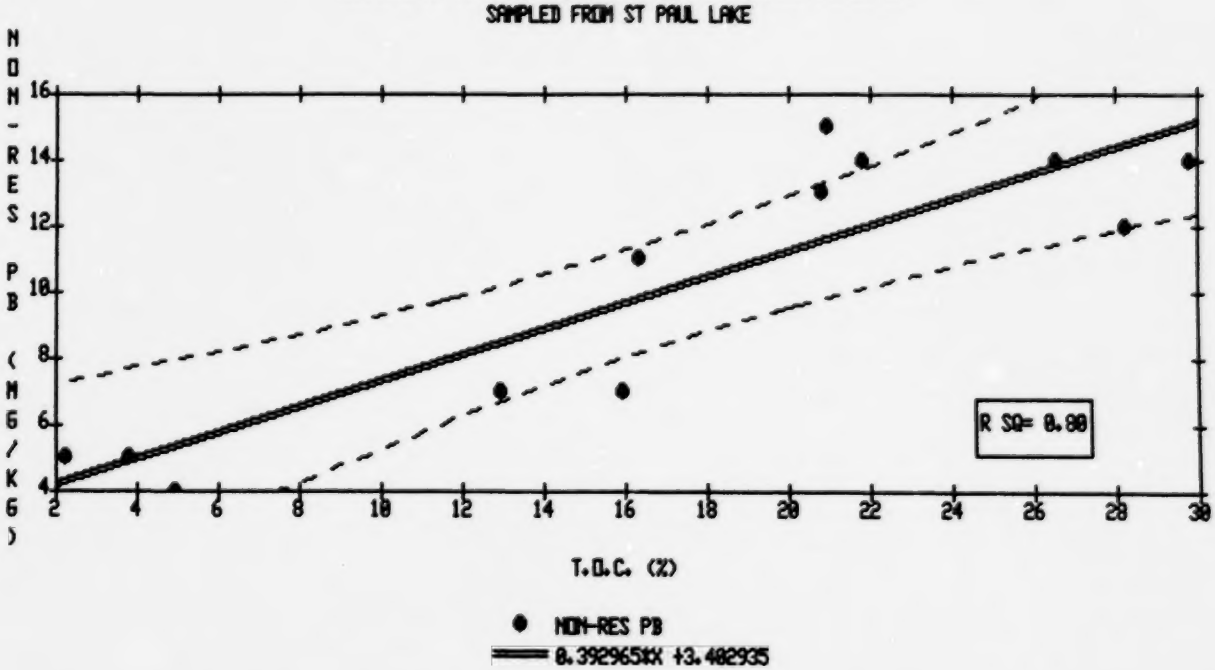
NOTE: DASHED LINES ARE 95% CONFIDENCE
LIMITS OF THE REGRESSION LINE.

FIG.23
NON-RES CU VS TOTAL ORGANIC CARBON IN BOTTOM SEDIMENTS
SAMPLED FROM ST PAUL LAKE



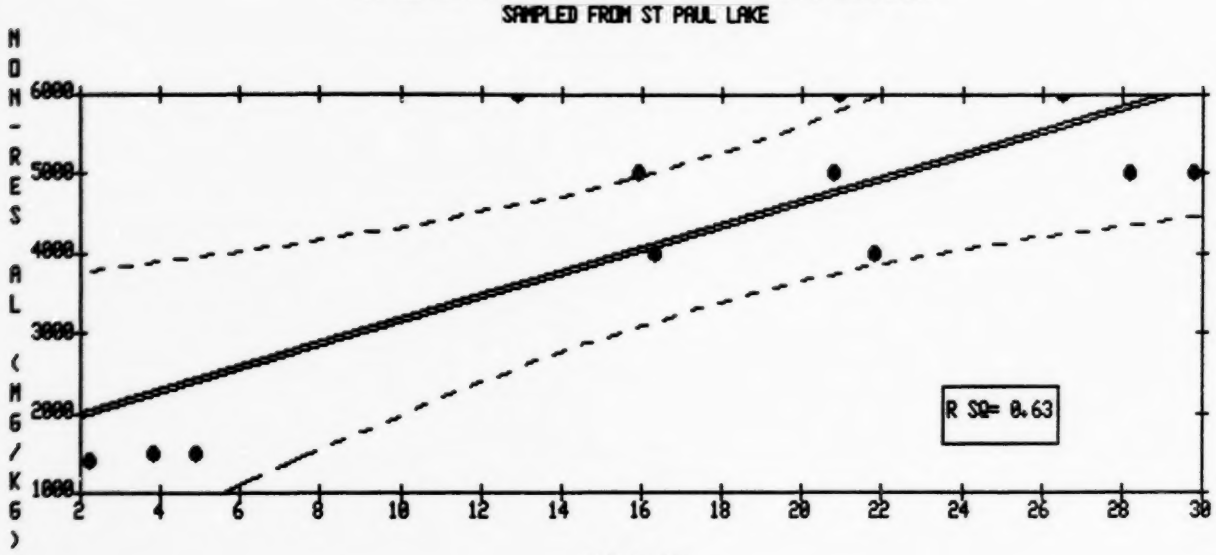
NOTE: DASHED LINES ARE 95% CONFIDENCE
LIMITS OF THE REGRESSION LINE.

FIG.24
NON-RES PB VS TOTAL ORGANIC CARBON IN BOTTOM SEDIMENTS
SAMPLED FROM ST PAUL LAKE



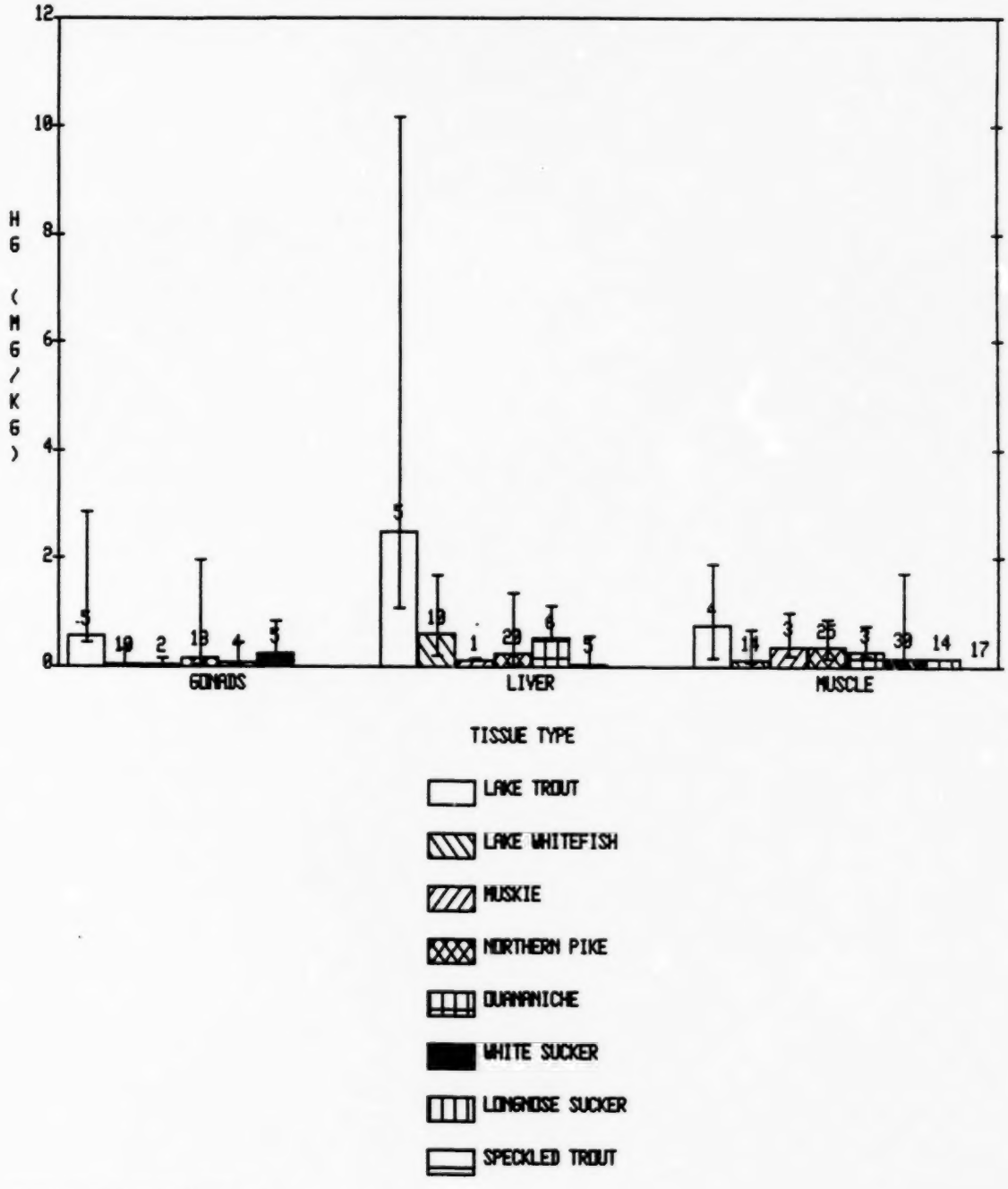
NOTE: DASHED LINES ARE 95% CONFIDENCE
LIMITS OF THE REGRESSION LINE.

FIG.25
NON-RES AL VS TOTAL ORGANIC CARBON IN BOTTOM SEDIMENTS
SAMPLED FROM ST PAUL LAKE



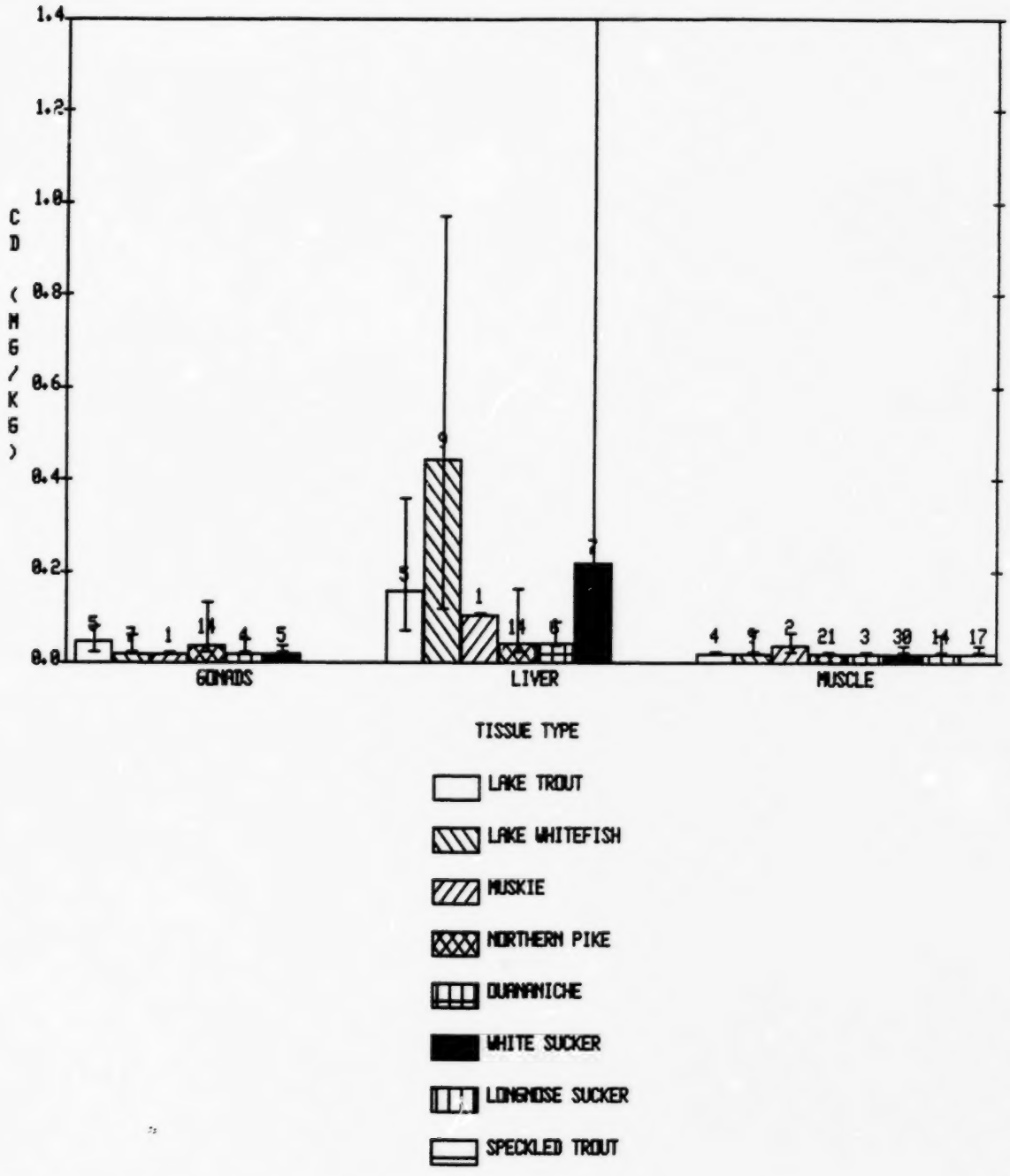
NOTE: DASHED LINES ARE 95% CONFIDENCE
LIMITS OF THE REGRESSION LINE.

FIG.26
MEDIAN AND RANGE OF HG IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



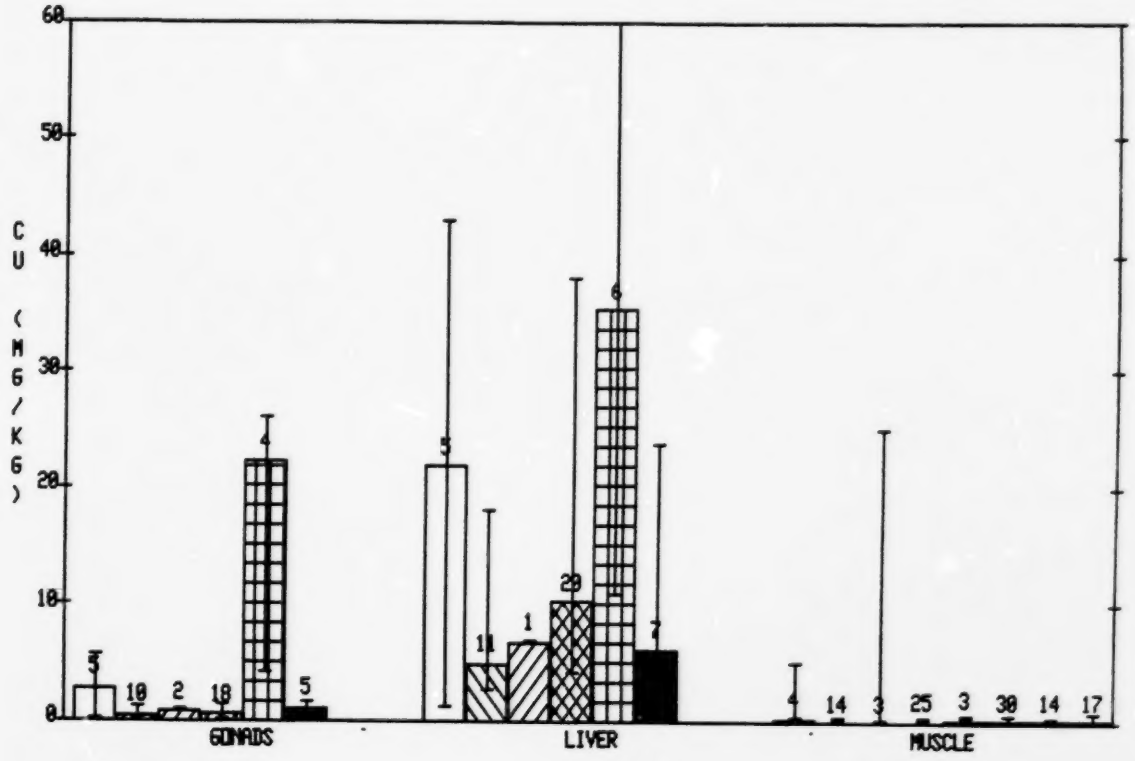
NOTE: NUMBER ON TOP OF BAR
INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.27
MEDIAN AND RANGE OF CD IN GONADS, LIVER AND MUSCLE OF
DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



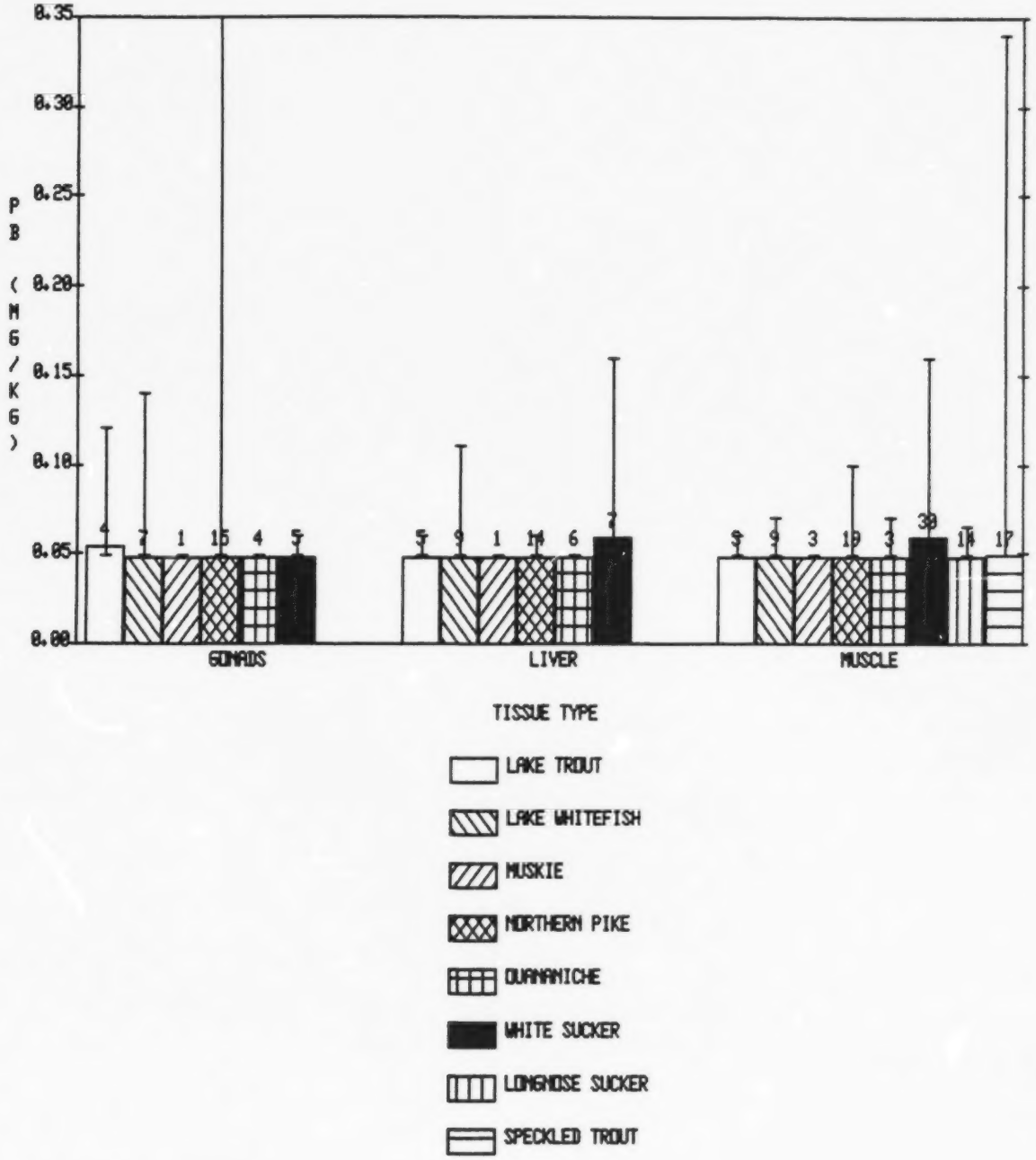
NOTE: NUMBER ON TOP OF BAR
INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.28
MEDIAN AND RANGE OF CU IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



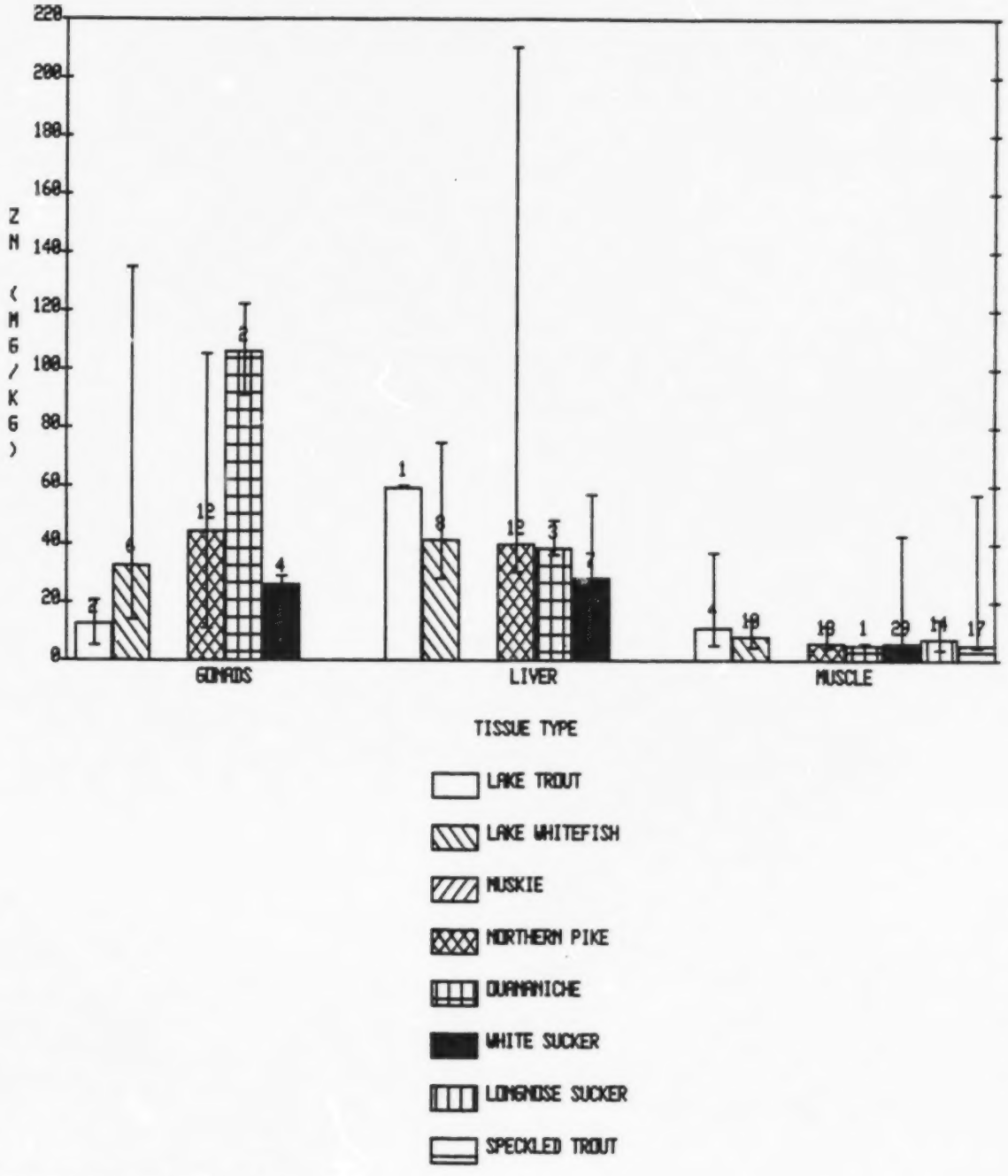
NOTE: NUMBER ON TOP OF BAR INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.29
MEDIAN AND RANGE OF PB IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



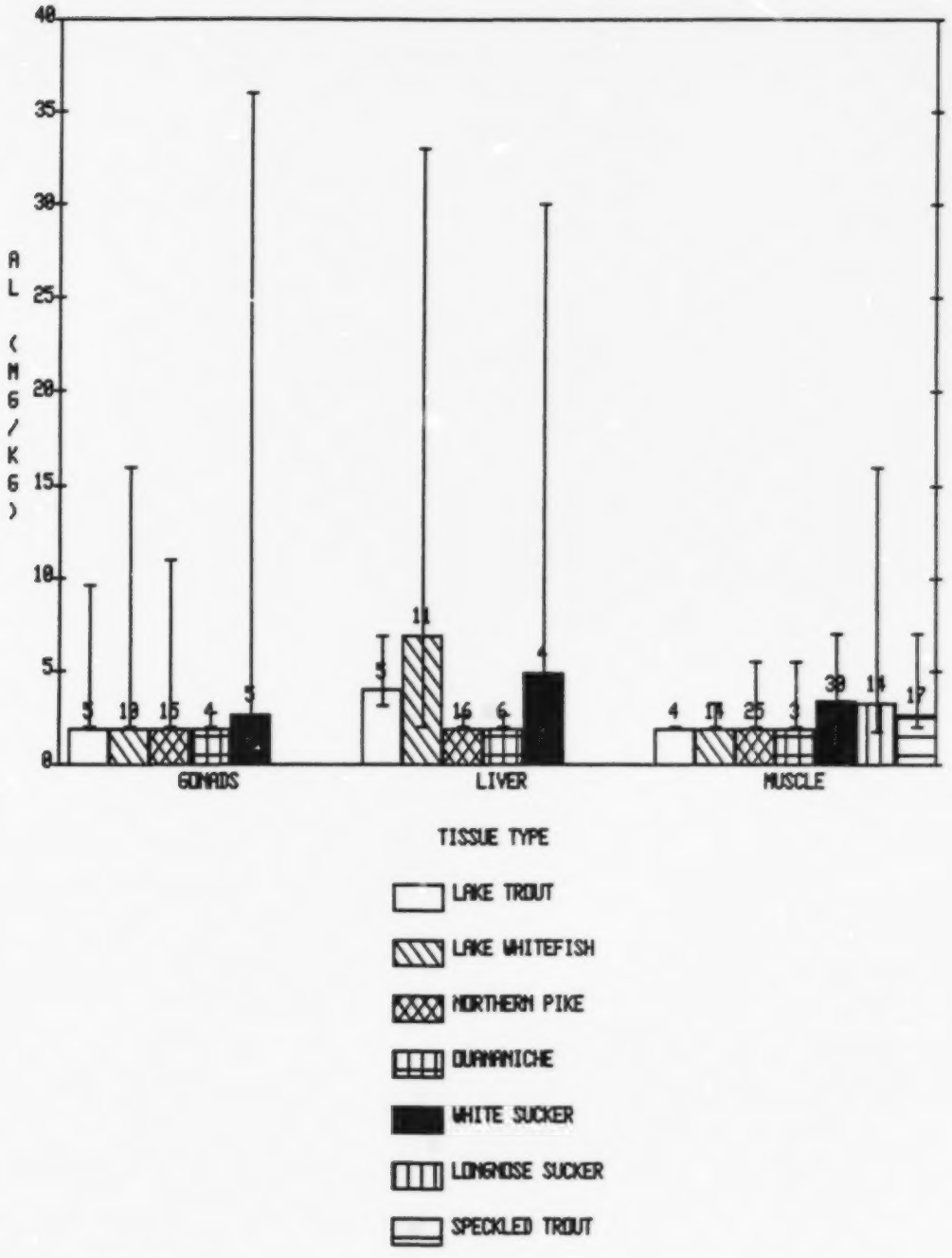
NOTE: NUMBER ON TOP OF BAR
INDICATES NUMBER OF
SAMPLES ANALYZED.

FIG.38
MEDIAN AND RANGE OF ZINC IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



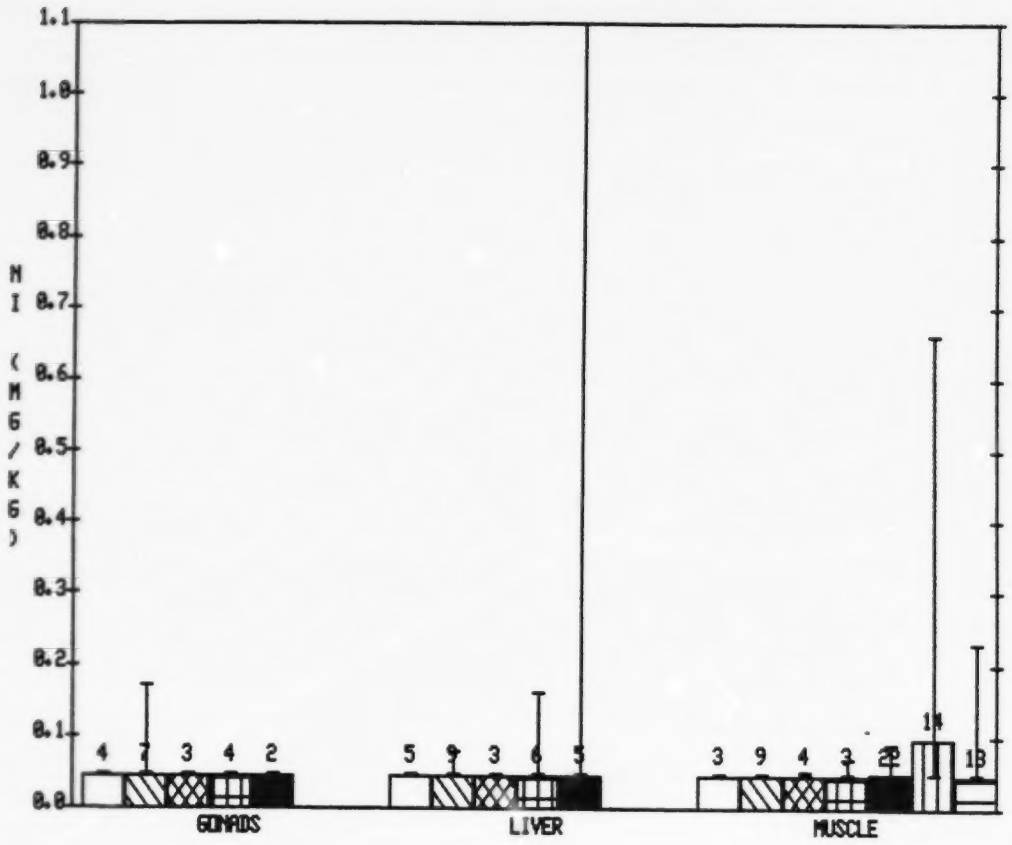
NOTE: NUMBER ON TOP OF BAR -
INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.31
MEDIAN AND RANGE OF AL IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



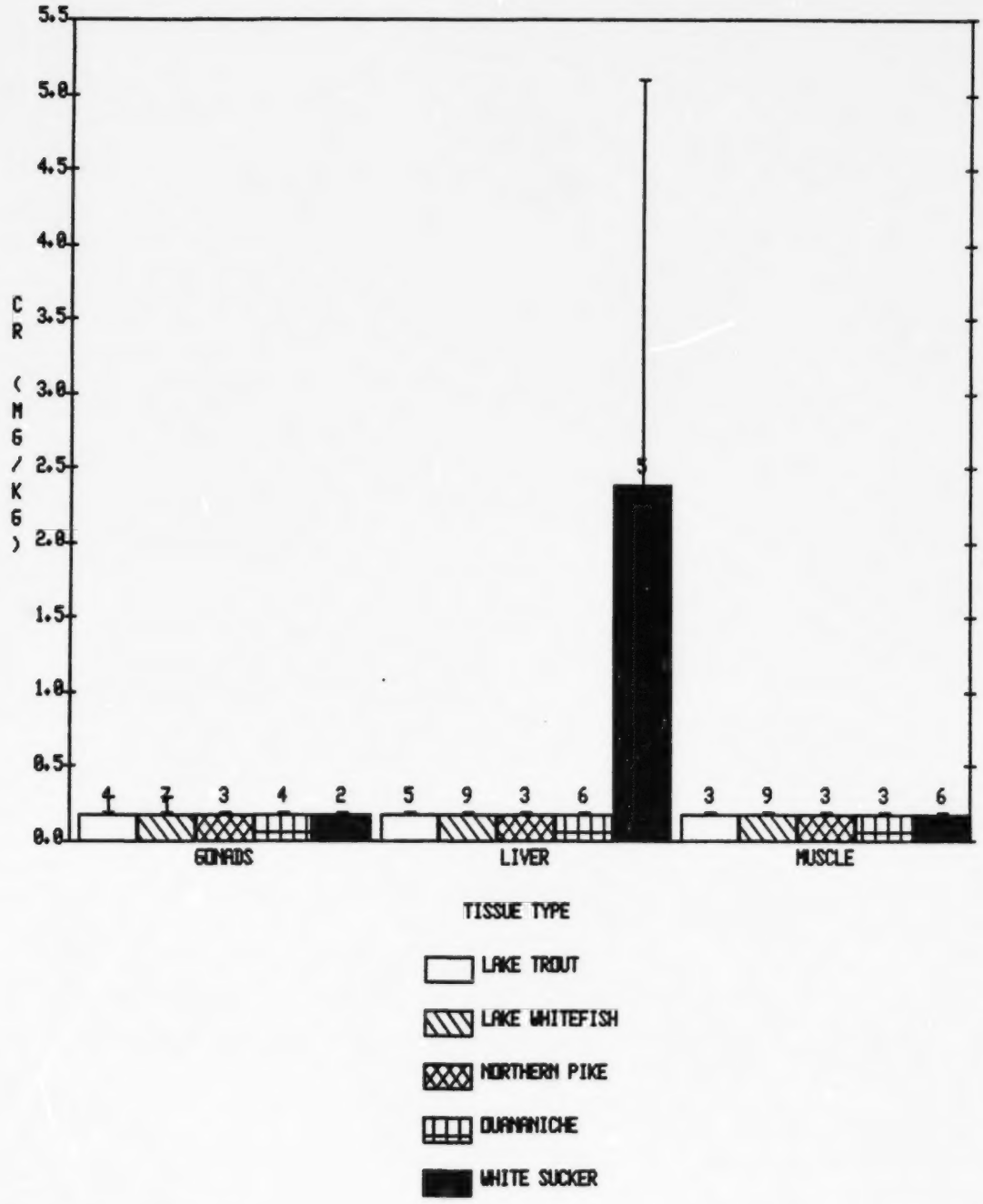
NOTE: NUMBER ON TOP OF BAR
INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.32
MEDIAN AND RANGE OF NI IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



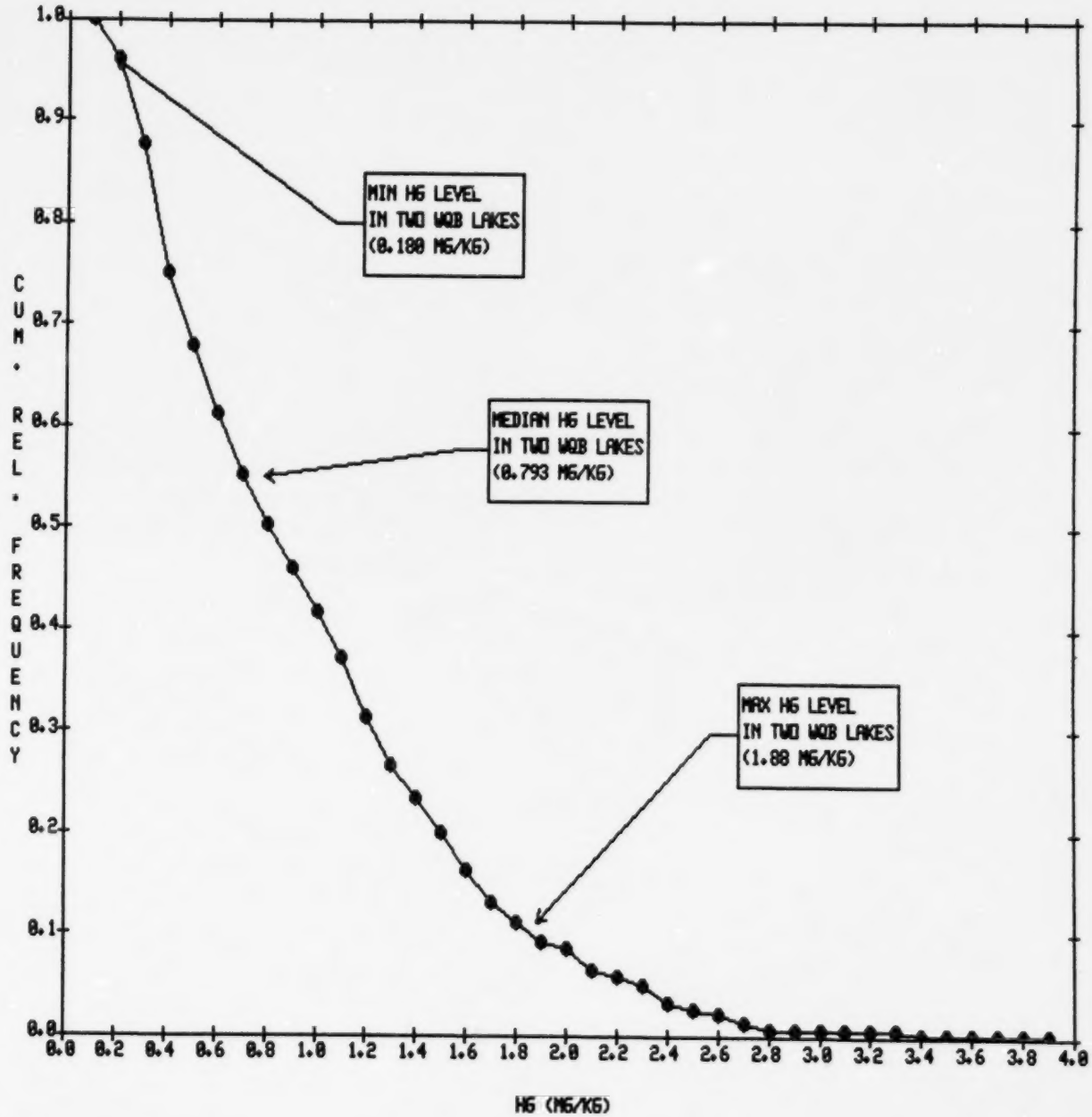
NOTE: NUMBER ON TOP OF BAR
INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.33
MEDIAN AND RANGE OF CR IN GONADS, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH FROM
FIVE SOUTHERN LABRADOR LAKES



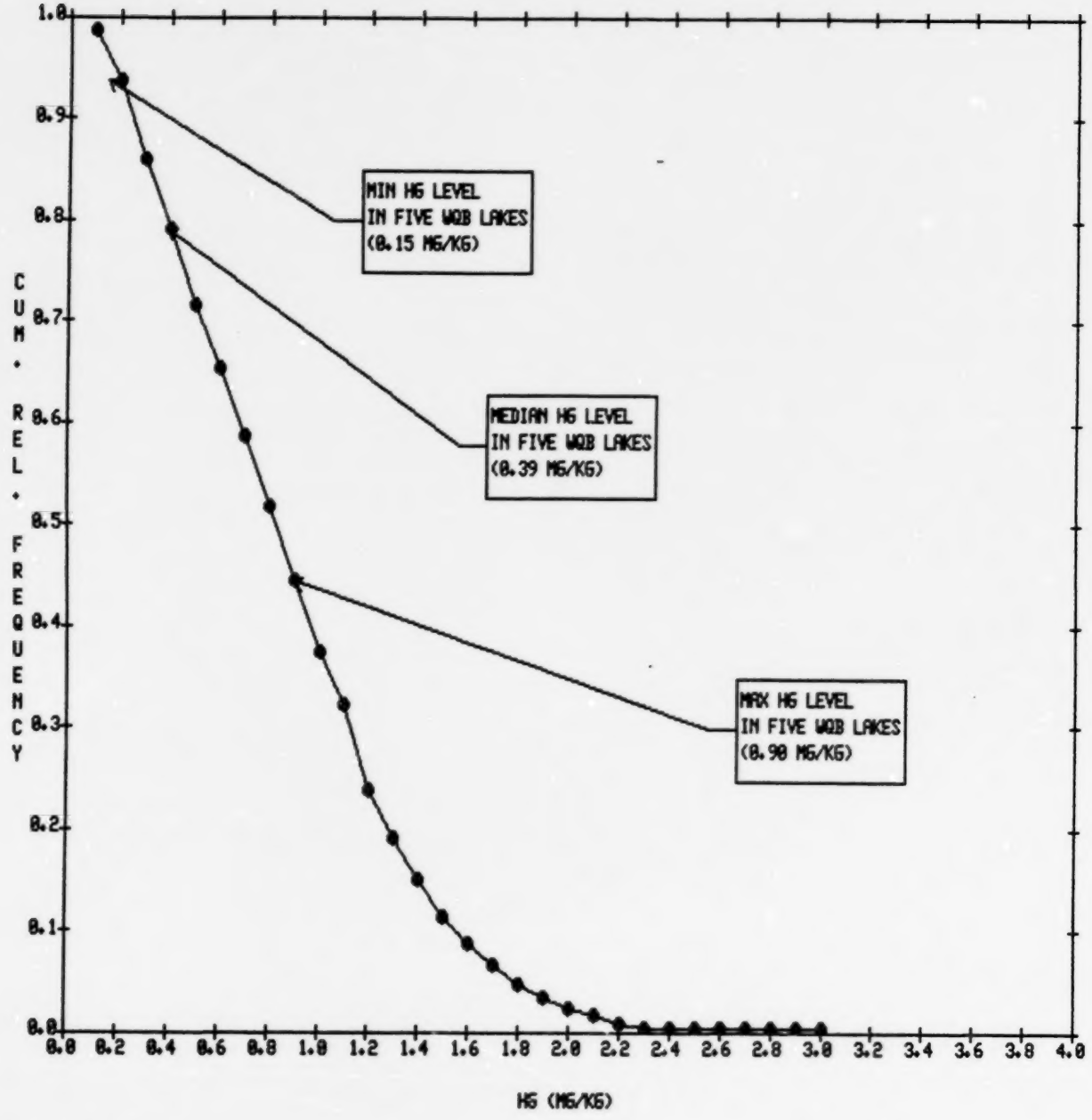
NOTE: NUMBER ON TOP OF BAR
INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.34
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF H6
IN MUSCLE TISSUE OF LAKE TROUT
SAMPLED FROM FORTY-ONE LOCATIONS IN LABRADOR



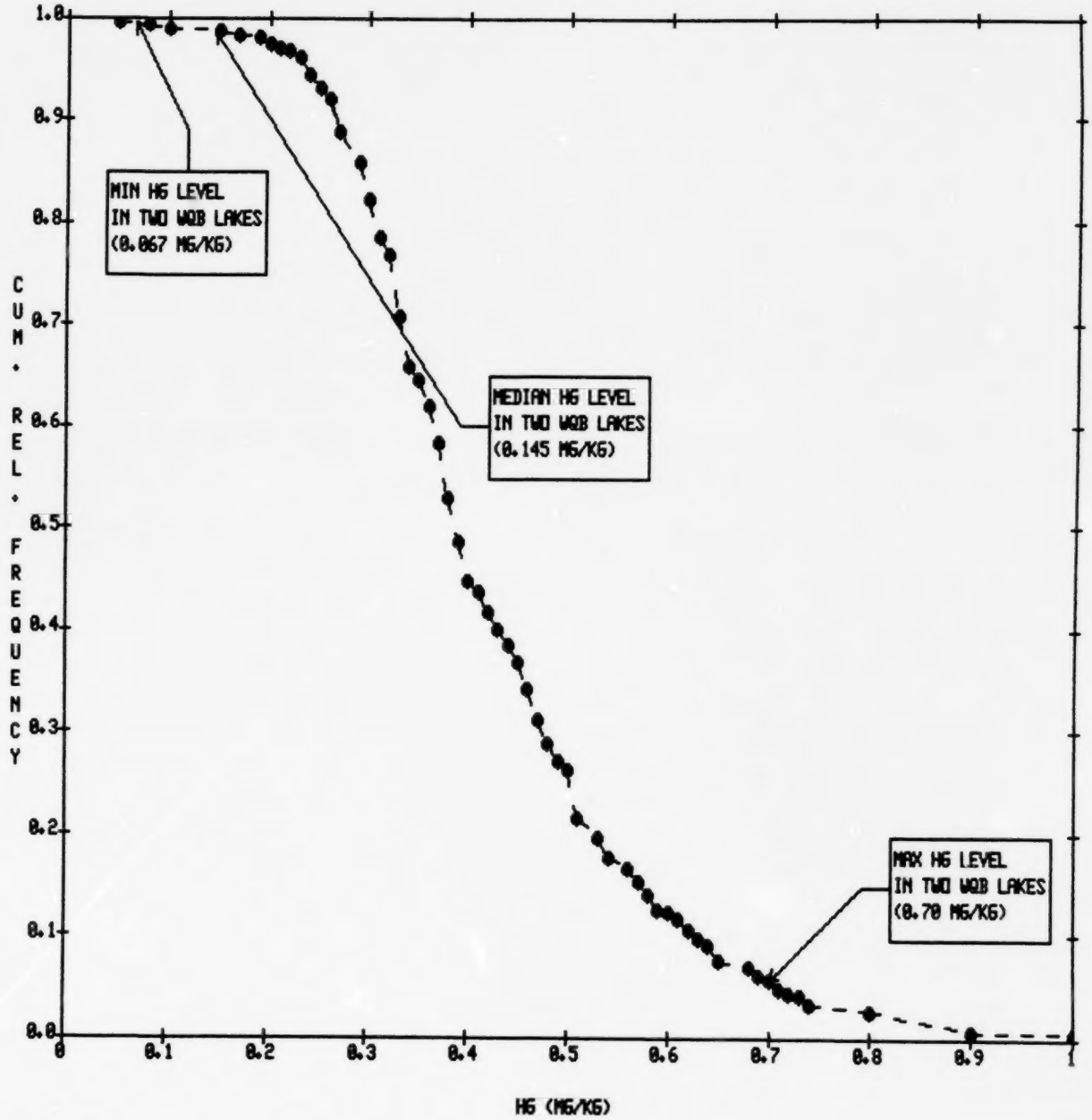
NO OF SAMPLES = 752
MEDIAN H6 = 0.81 M6/K6
MIN H6 = 0.10 M6/K6
MAX H6 = 3.93 M6/K6

FIG.35
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF HG
IN MUSCLE TISSUE OF NORTHERN PIKE SAMPLED FROM
FORTY-ONE LOCATIONS IN LABRADOR



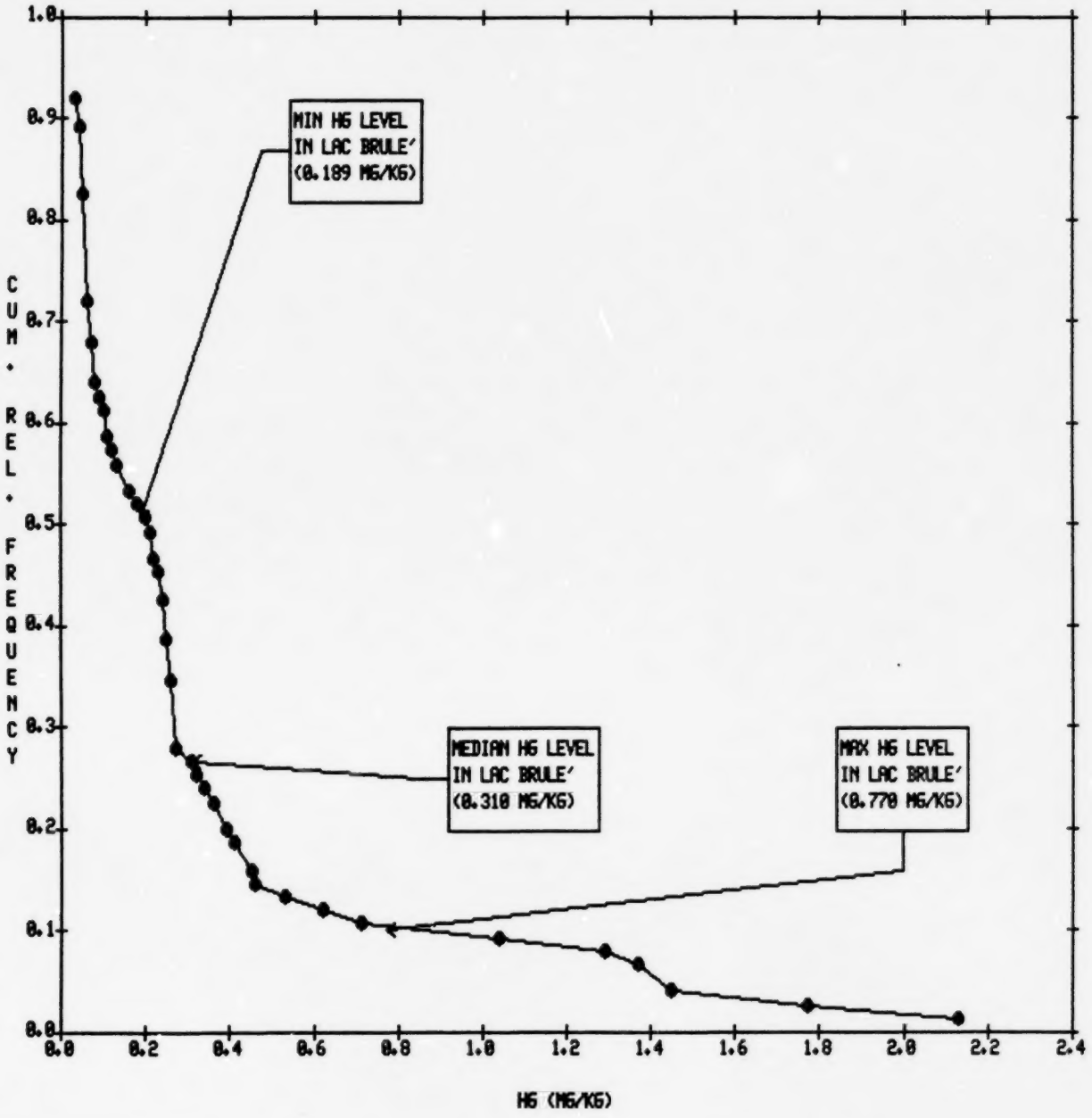
NO OF SAMPLES = 741
MEDIAN HG = 0.04 MG/KG
MIN HG = 0.010 MG/KG
MAX HG = 3.00 MG/KG

FIG.36
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF H6
IN MUSCLE TISSUE OF LAKE WHITEFISH
SAMPLED FROM FORTY-NINE LOCATIONS IN LABRADOR



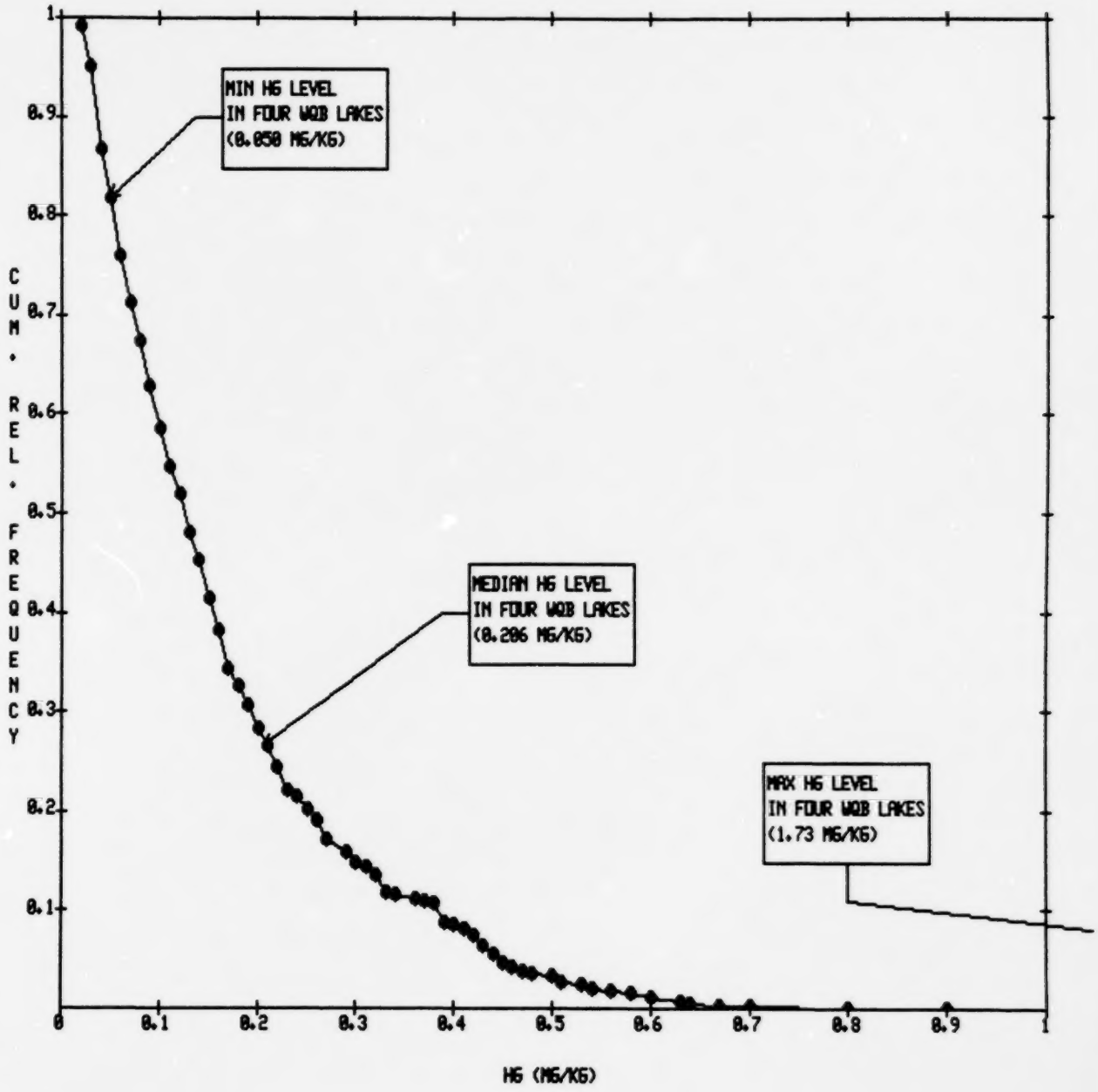
NO OF SAMPLES = 382
MEDIAN H6= 0.38 M6/K6
MIN. H6 = 0.040 M6/K6
MAX. H6 = 1.85 M6/K6

FIG.37
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF H6
IN MUSCLE TISSUE OF OUANANICHE
SAMPLED FROM SIXTEEN LOCATIONS IN LABRADOR



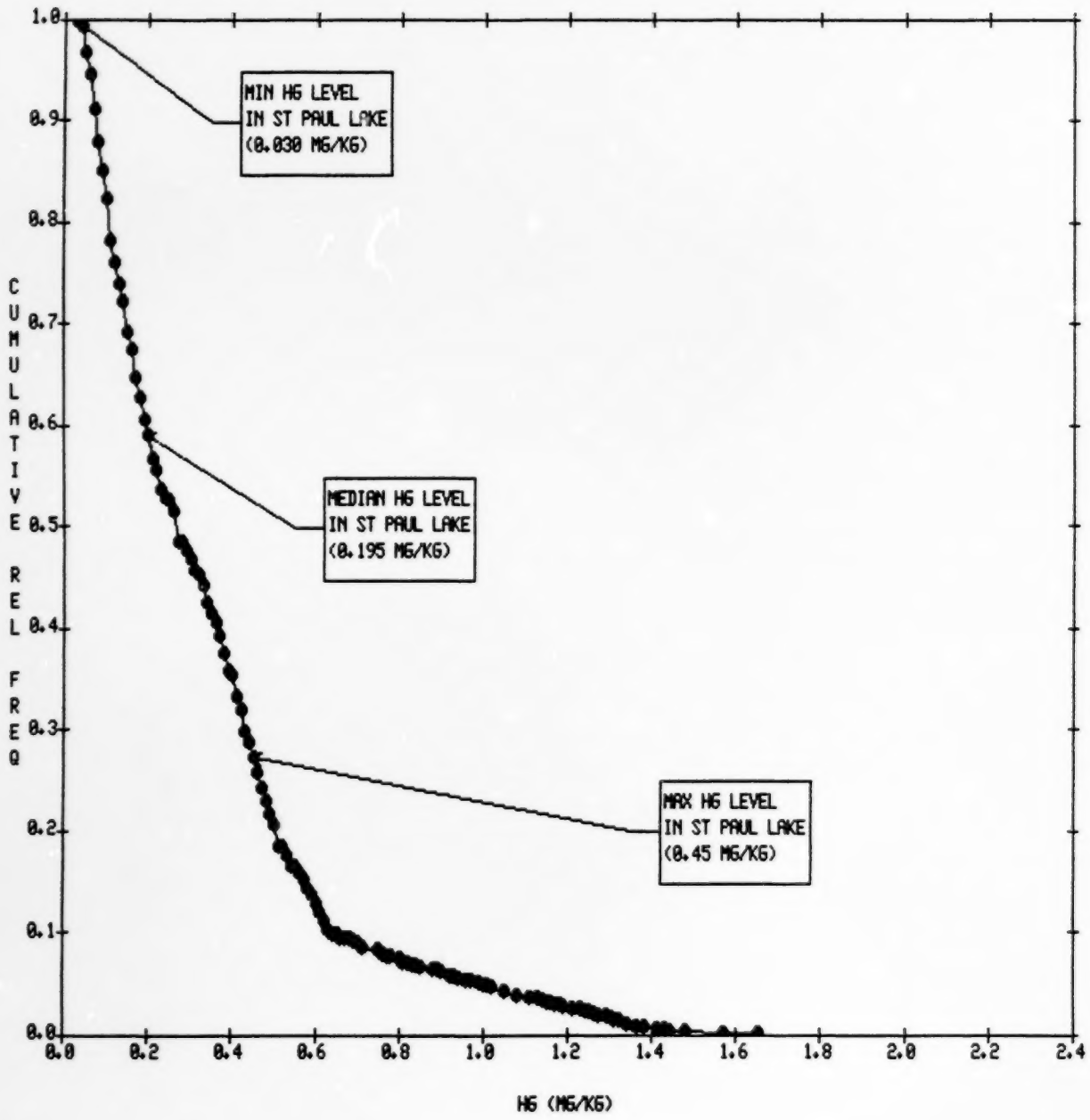
NO OF SAMPLES = 75
MEDIAN H6 = 0.2 M6/K6
MIN H6 = 0.01 M6/K6
MAX H6 = 2.3 M6/K6

FIG.38
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF HG
IN MUSCLE TISSUE OF WHITE SUCKERS SAMPLED FROM
THIRTY-SEVEN LOCATIONS IN LABRADOR



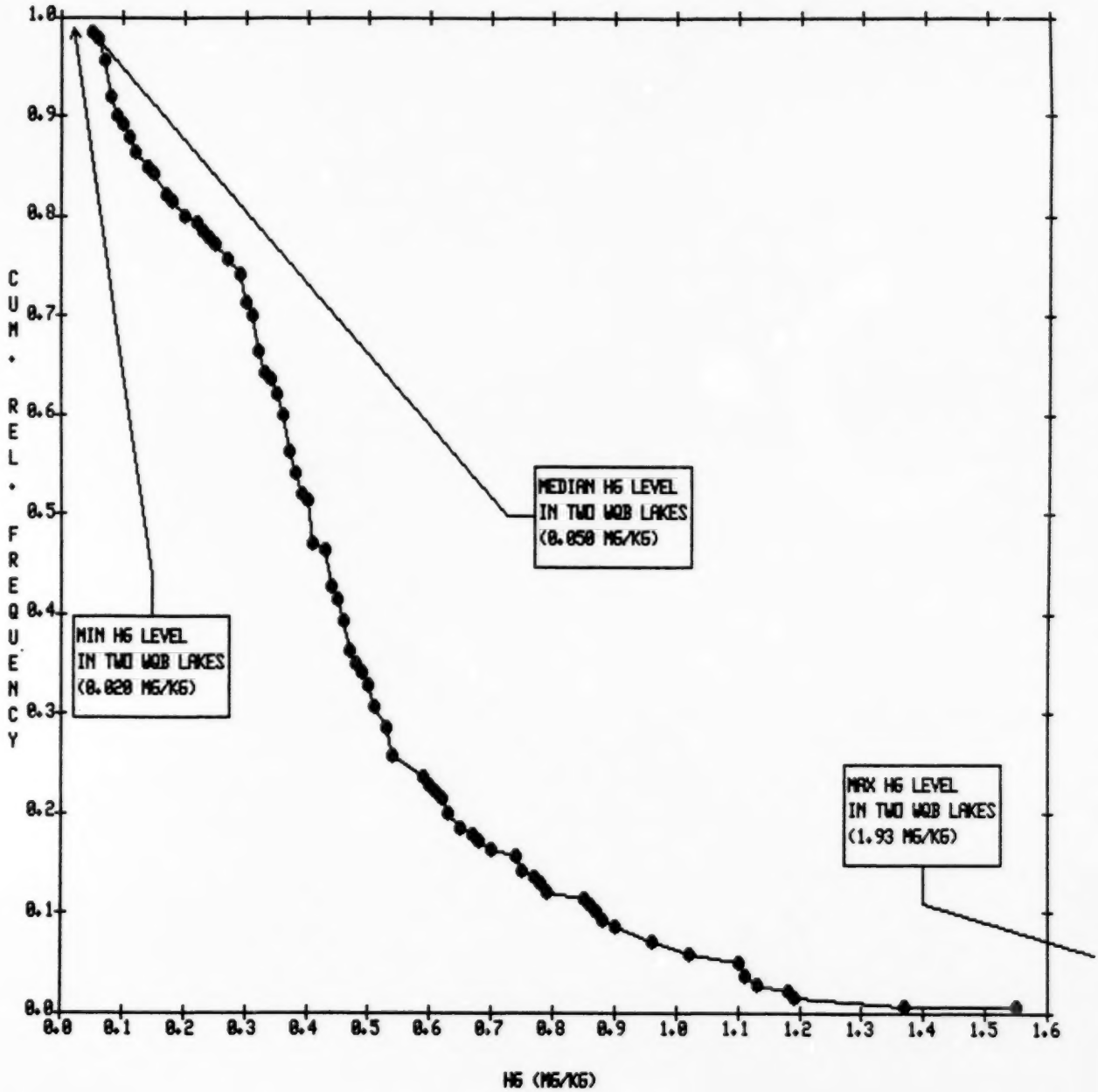
NO OF SAMPLES = 429
MEDIAN HG = 0.12 MG/KG
MIN. HG = 0.010 MG/KG
MAX. HG = 0.90 MG/KG

FIG.39
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF HG
IN MUSCLE TISSUE OF LONGNOSE SUCKERS
SAMPLED FROM FORTY-THREE LOCATIONS IN LABRADOR



NO OF SAMPLES = 881
MEDIAN = 0.27 MG/KG
MIN HG = 0.020 MG/KG
MAX HG = 2.93 MG/KG

FIG.40
CUMULATIVE RELATIVE FREQUENCY OF OCCURRENCE OF HG
IN MUSCLE TISSUE OF SPECKLED TROUT
SAMPLED FROM TWENTY-FOUR LOCATIONS IN LABRADOR



NO OF SAMPLES = 140
MEDIAN HG = 0.40 MG/KG
MIN HG = 0.040 MG/KG
MAX HG = 1.54 MG/KG

FIG.41
RELATIVE LEVELS OF HG IN MUSCLE TISSUE OF SEVEN DIFFERENT SPECIES OF FISH FROM FIVE SOUTHERN LABRADOR LAKES
(HG IN LAKE TROUT MUSCLE = 1.00)

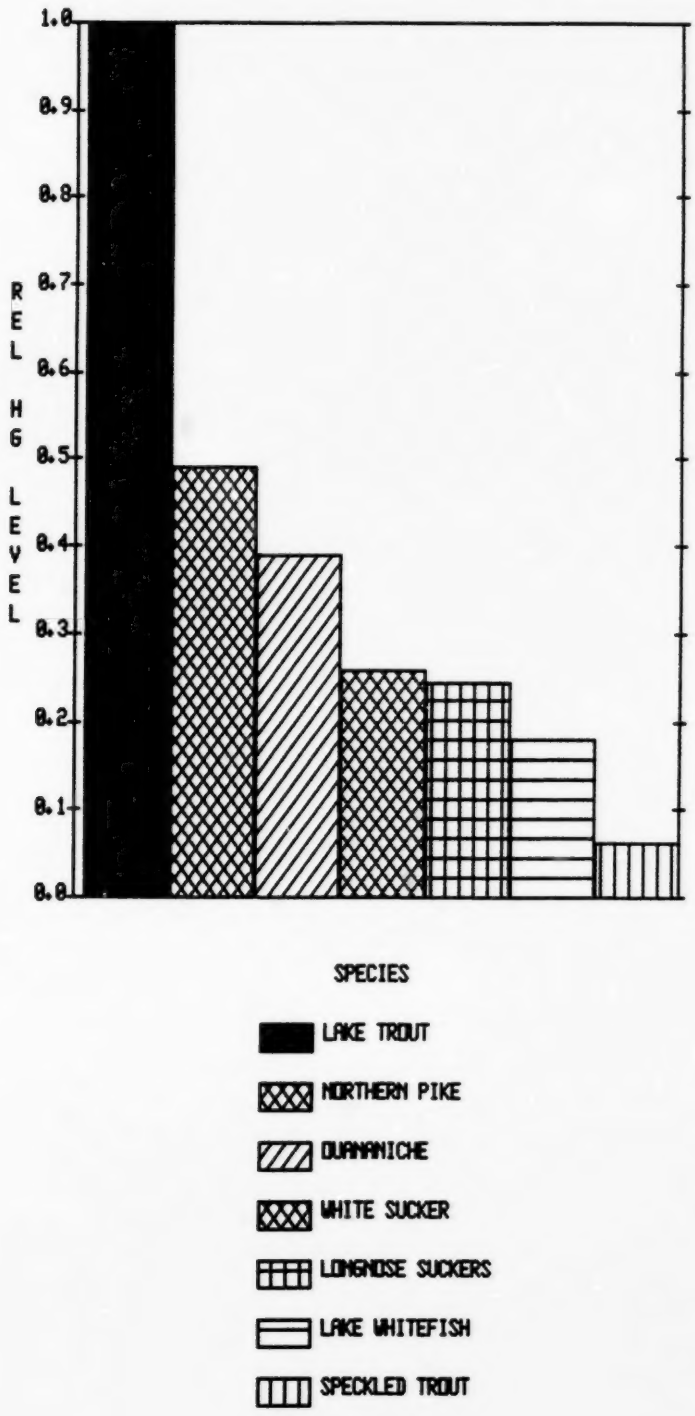
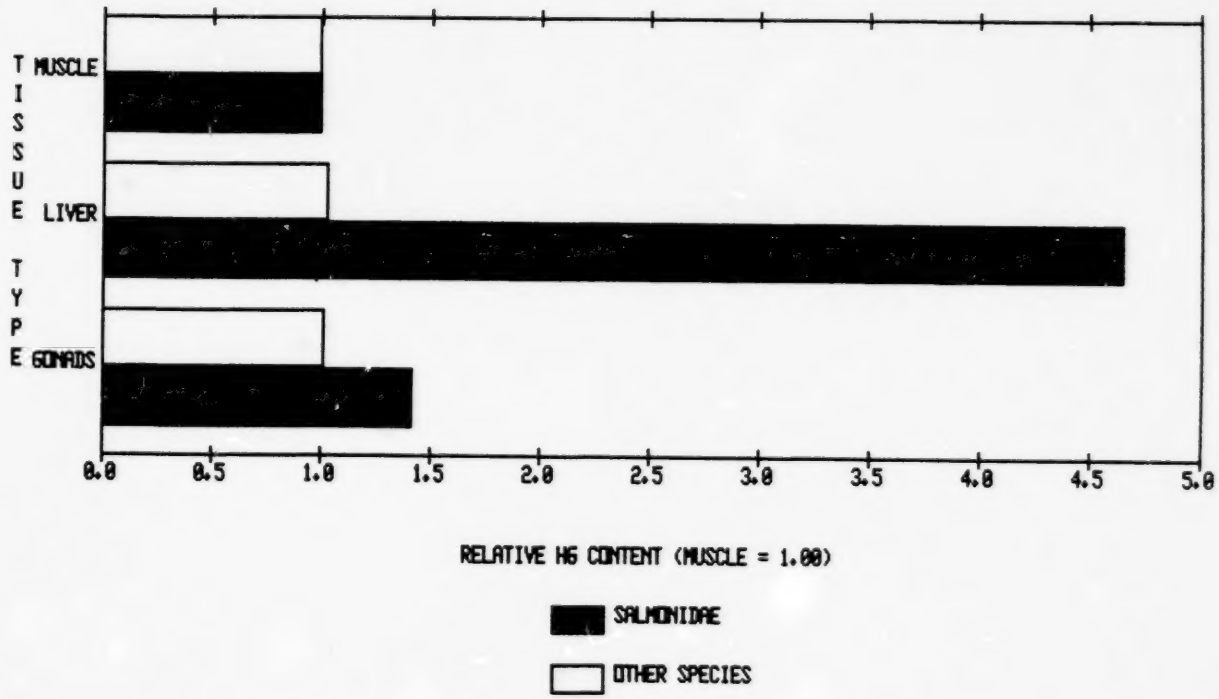


FIG.42
RELATIVE HG CONTENT OF FISH TISSUE



EXIT

FIG.43
MEDIAN AND RANGE OF T-DDT
IN GONADS, HEART, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH
FROM FIVE SOUTHERN LABRADOR LAKES

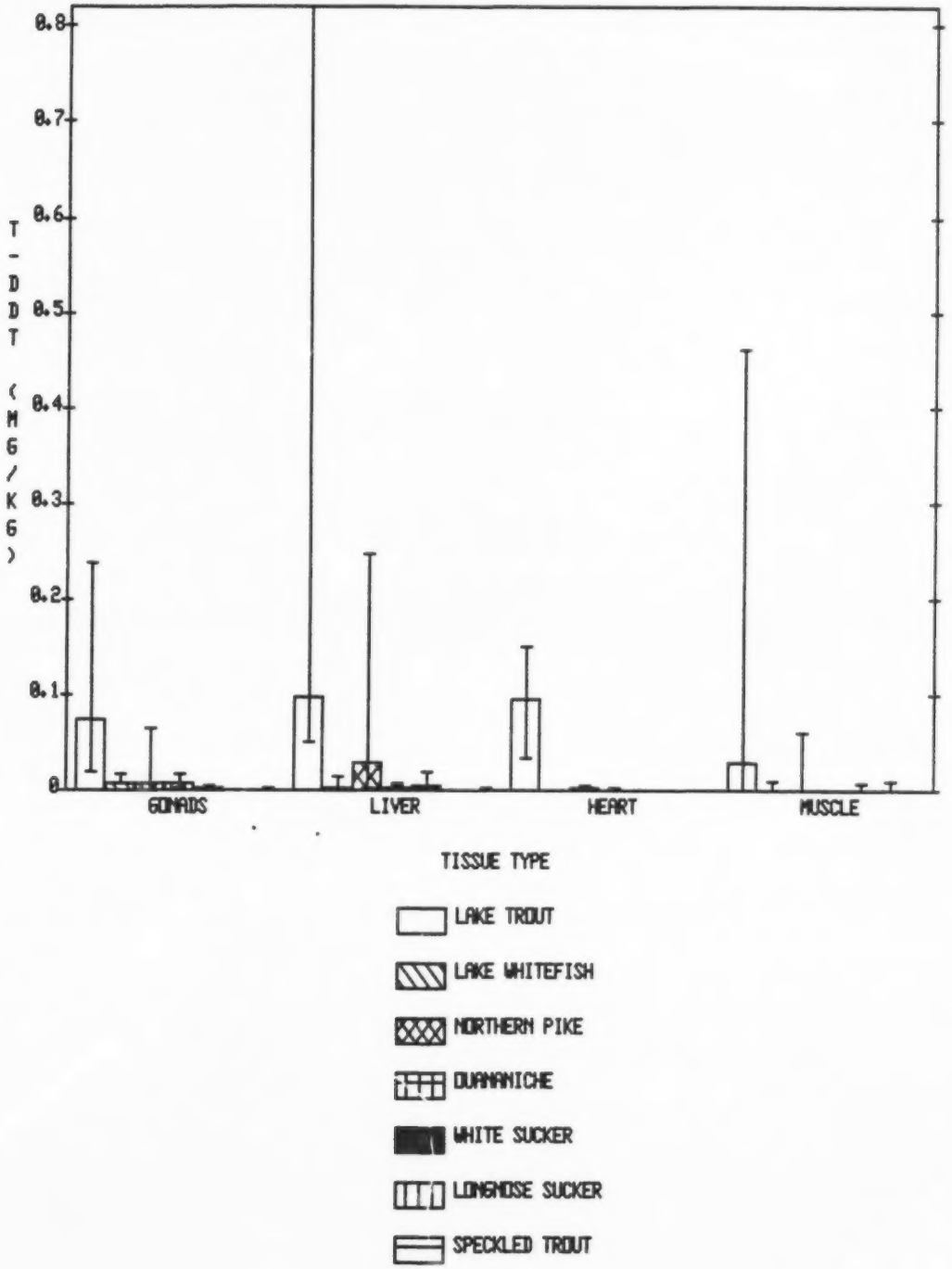


FIG.44
MEDIAN AND RANGE OF O,P-DDT
IN GONADS, HEART, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH
FROM FIVE SOUTHERN LABRADOR LAKES

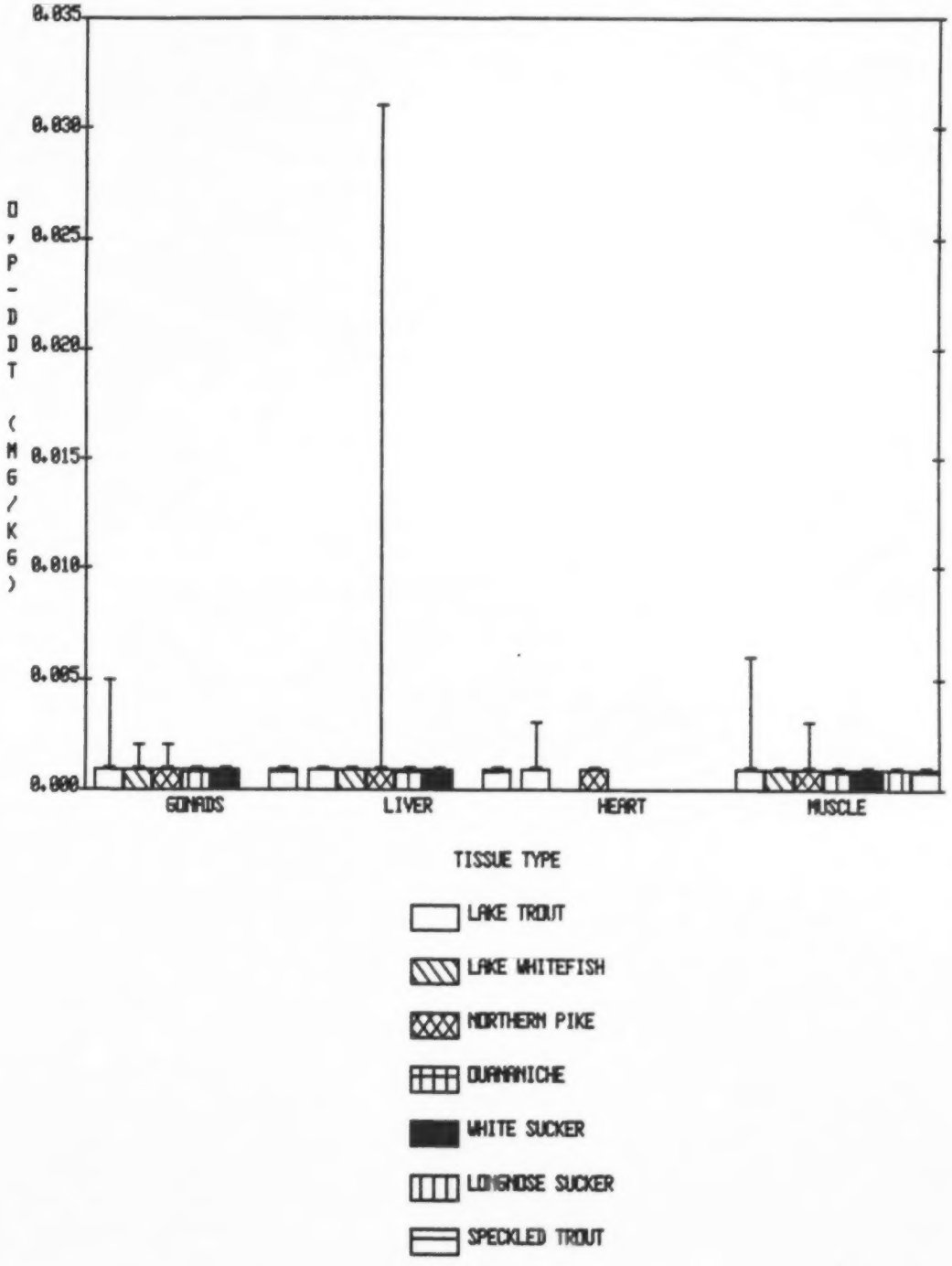


FIG.45
MEDIAN AND RANGE OF P,P'-DDE
IN GONADS, HEART, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH
FROM FIVE SOUTHERN LABRADOR LAKES

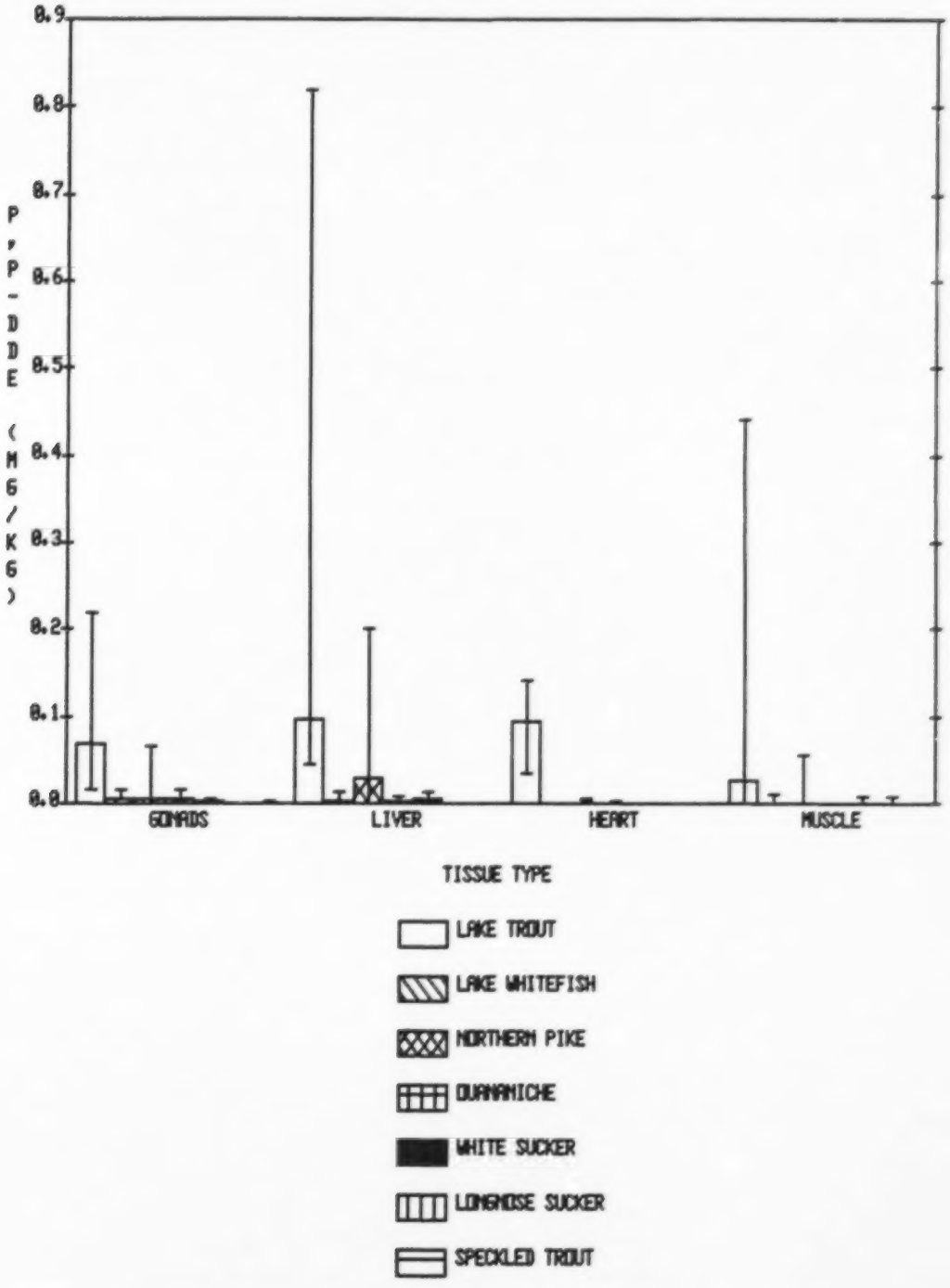


FIG.46
MEDIAN AND RANGE OF P,P-DDD
IN GONADS, HEART, LIVER AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH
FROM FIVE SOUTHERN LABRADOR LAKES

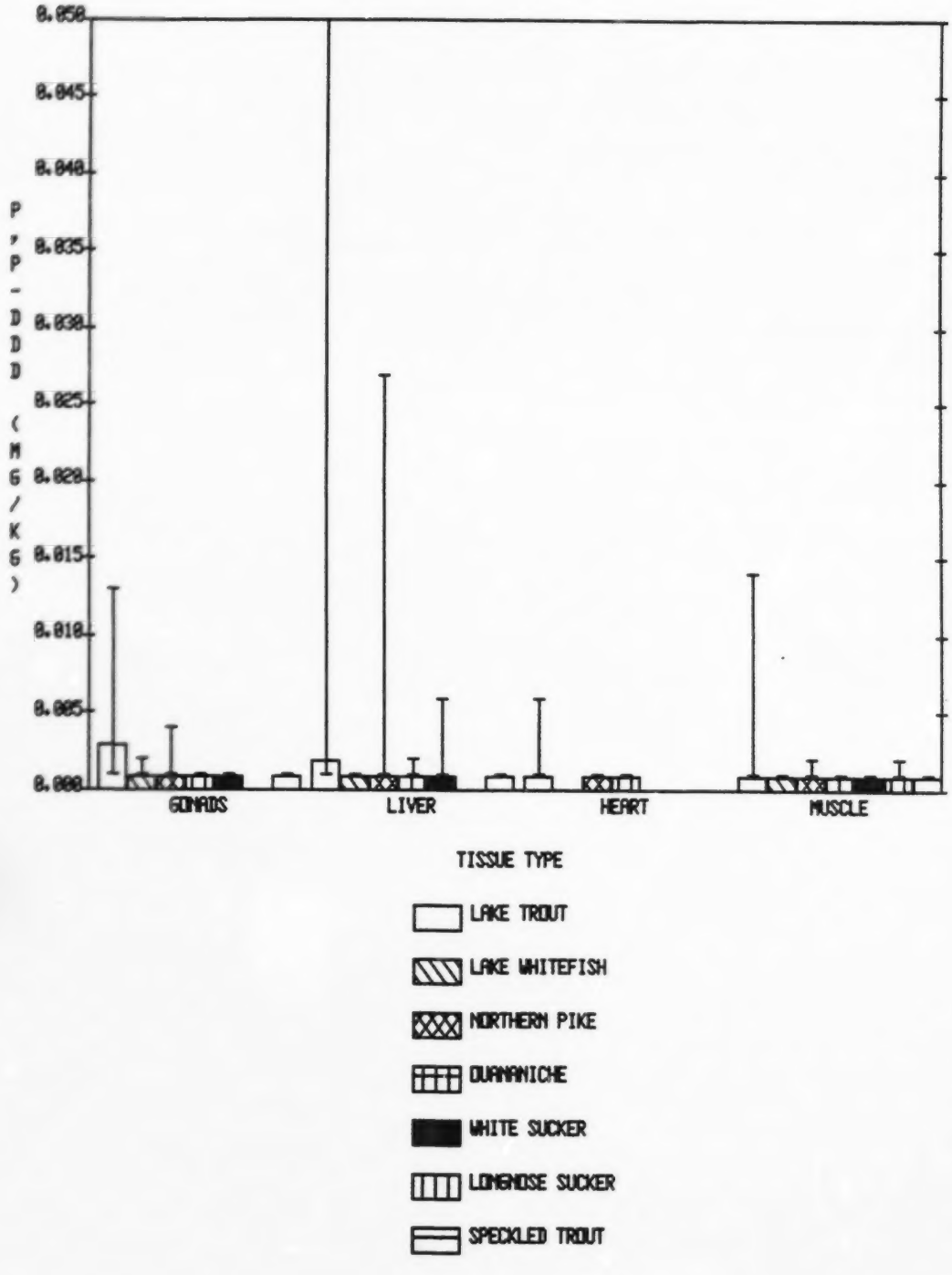


FIG.47
MEDIAN AND RANGE OF ALPHA-BHC
IN GONADS, LIVER HEART AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH
FROM FIVE SOUTHERN LABRADOR LAKES

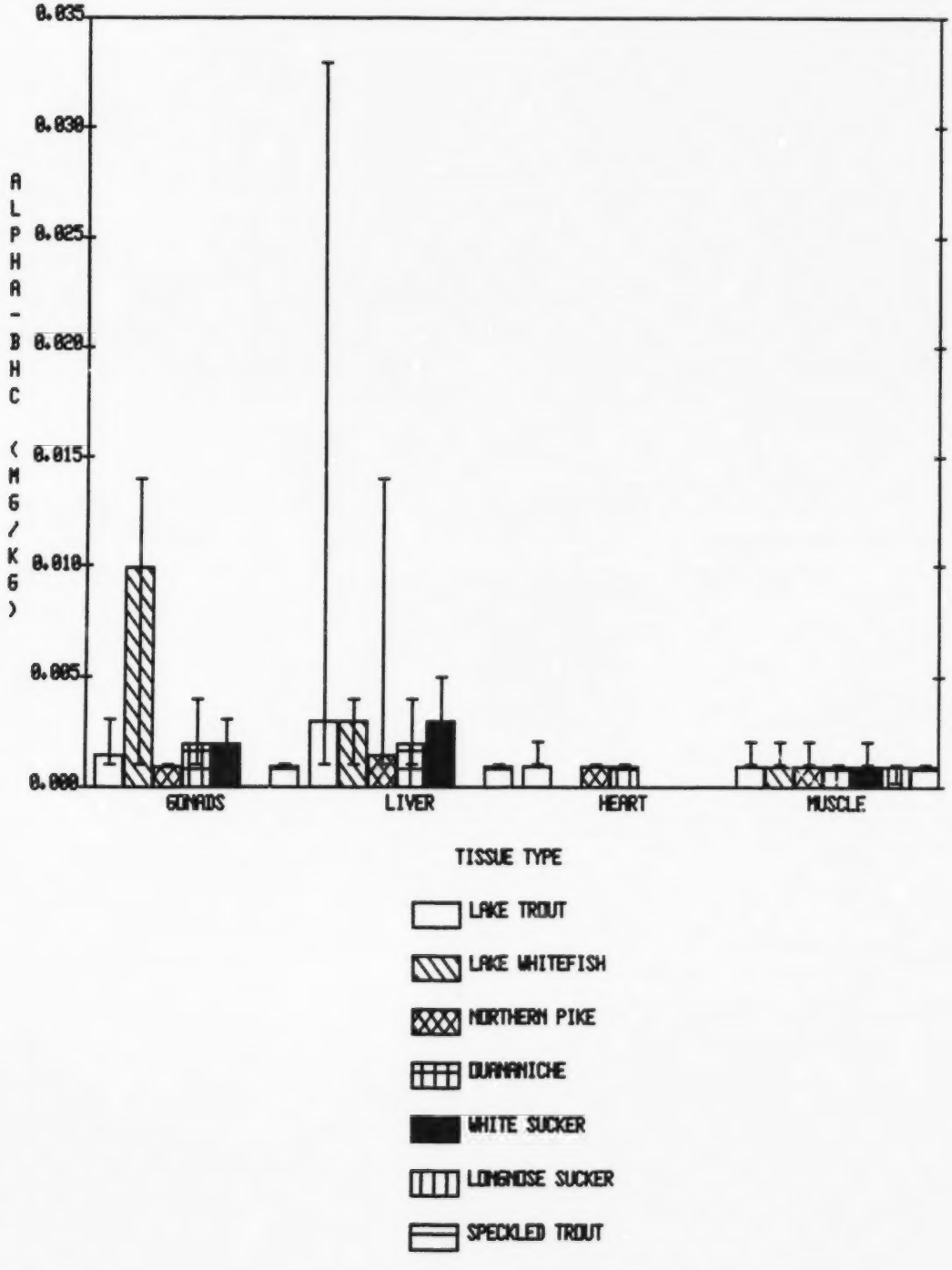
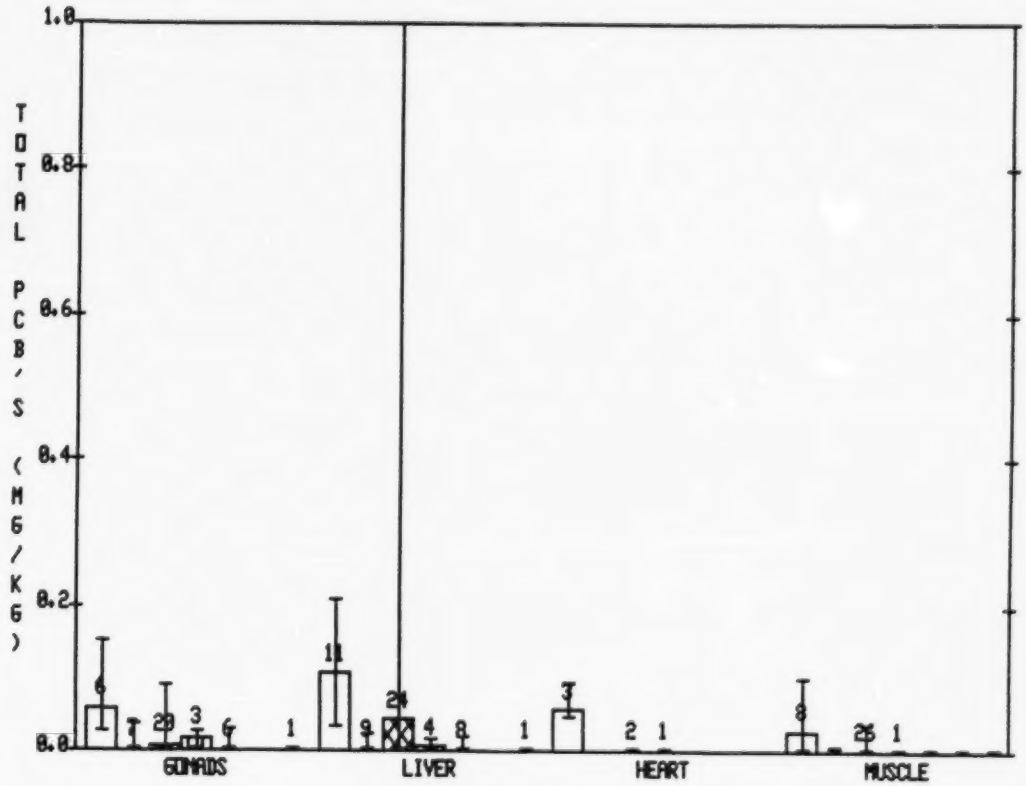


FIG.48
MEDIAN AND RANGE OF TOTAL PCB'S
IN GONADS, LIVER, HEART, AND MUSCLE TISSUE
OF DIFFERENT SPECIES OF FISH
FROM FIVE SOUTHERN LABRADOR LAKES



TISSUE TYPE

- LAKE TROUT
- LAKE WHITEFISH
- NORTHERN PIKE
- OUANANICHE
- WHITE SUCKER
- LONGNOSE SUCKER
- SPECKLED TROUT

NOTE: NUMBER ON TOP OF BAR INDICATES NUMBER OF SAMPLES ANALYZED.

FIG.49
MEDIAN AND RANGE OF LIPID CONTENT OF GONADS, LIVER AND MUSCLE
TISSUE SAMPLED FROM FISH CAPTURED IN ST AUGUSTIN AND ST PAUL LAKES

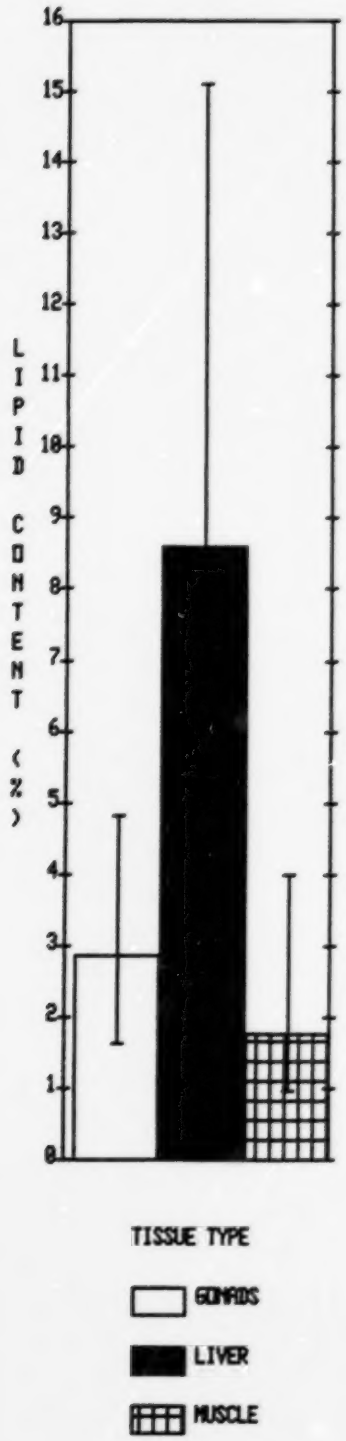
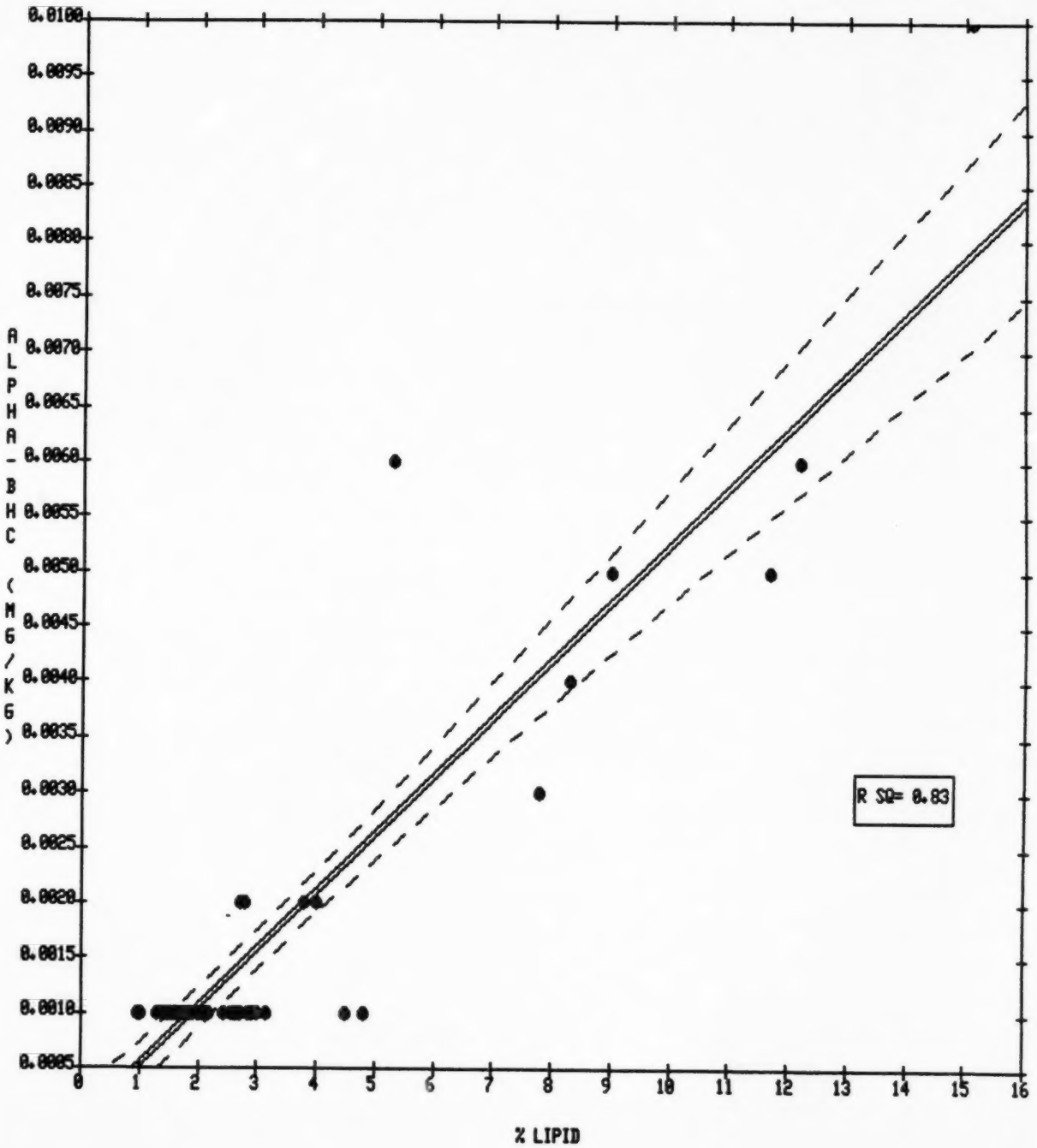
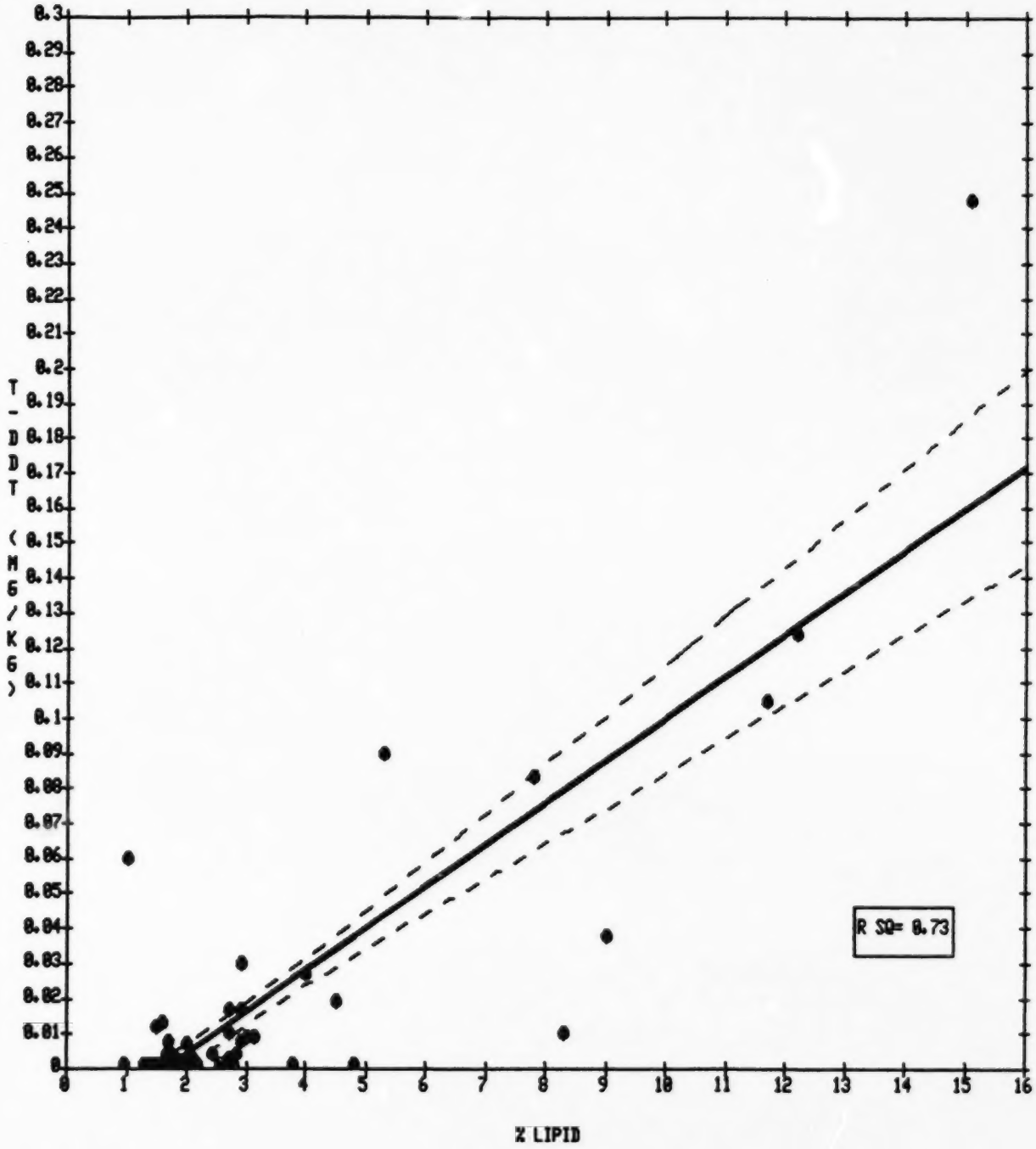


FIG.50
ALPHA-BHC VS % LIPID CONTENT OF FISH TISSUE



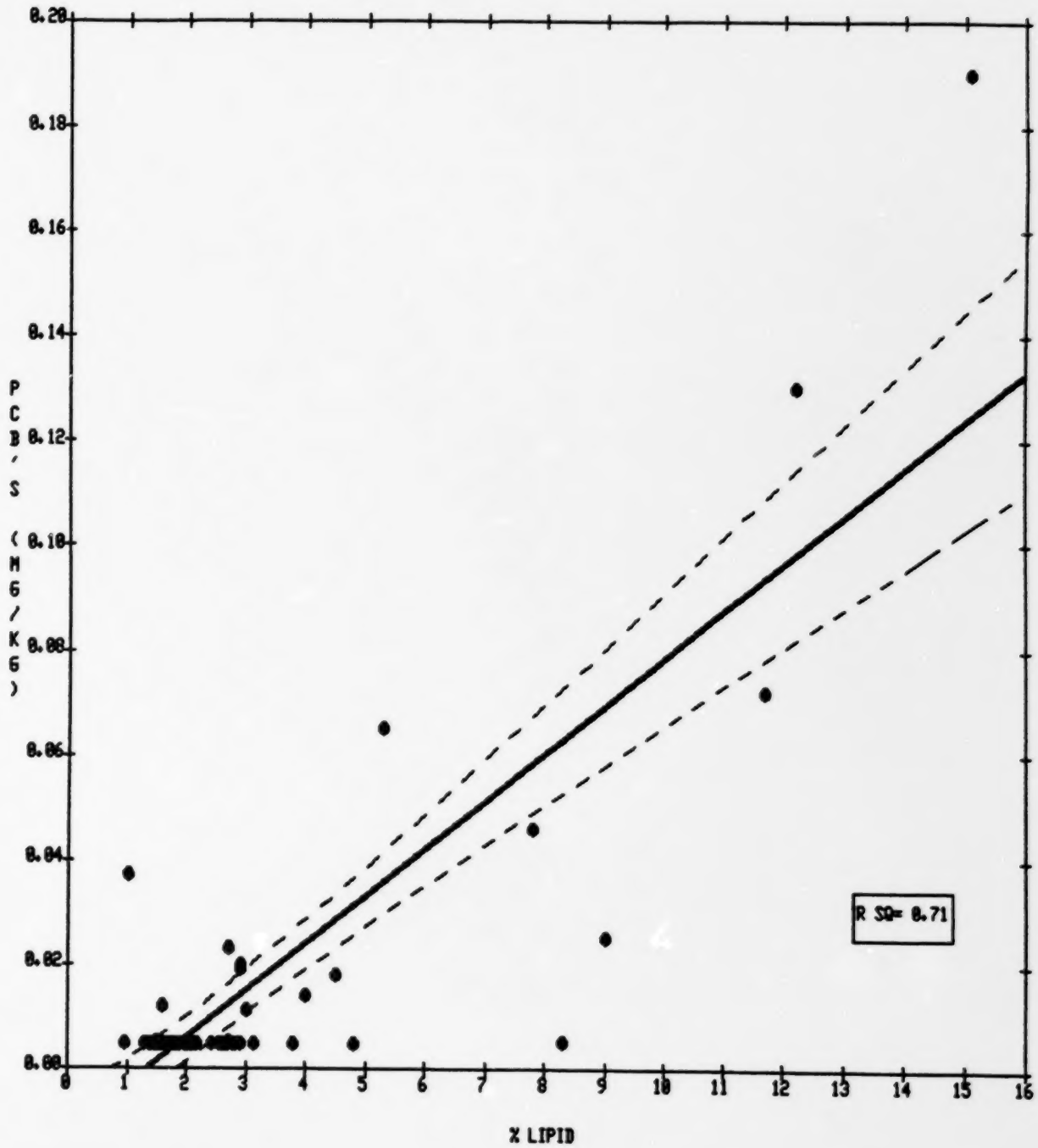
NOTE: DASHED LINES INDICATE
95% CONFIDENCE LIMITS OF
THE REGRESSION LINE.

FIG.51
T-DDT VS % LIPID CONTENT OF FISH TISSUE



NOTE: DASHED LINES INDICATE
95% CONFIDENCE LIMITS
OF THE REGRESSION LINE.

FIG.52
TOTAL PCB'S VS % LIPID CONTENT OF FISH TISSUE



NOTE: DASHED LINES INDICATE
95% CONFIDENCE LIMITS
OF THE REGRESSION LINE.